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GLAFCKE'S IMPROVEMENT IN PRISON CONSTRUCTION.

In prisons built according to the old system, chances of escape by digging or cutting through the prison walls, doors, floors, or ceilings are available to the prisoners, but, by constant improvements in such structures, escape has been rendered more and more difficult, and yet escapes frequently occur from the most modern prisons.

The latest improvement in prison construction, which forms the subject of our illustration, appears to furnish as nearly absolute security as it is possible to obtain, the result being secured in a very simple way, and by the use of low-priced material.

A prison constructed according to this system not only offers great resistance to any operation that will tend to destroy or injure it or render it less secure, but it also affords a ready means of indicating any tampering with the structure and also of giving an alarm in case of an attempt being made to break out of or into the prison.

The cells built according to this plan are made entirely of iron or steel pipes which intercommunicate, so that water or any other fluid may be kept under pressure in them. With this construction, should there be the slighest puncture or break, the small leak thus occasioned would at once give notice of the tampering with the pipes through the consequent reduction of pressure, which actuates an alarm; so that, before the operations necessary to an entrance into or escape from the locked cell could be fairly begun, the officers of the prison could be on hand to investigate the cause of the alarm. The walls, ceiling and floor of each cell are composed of pipes. The door, which is also composed of pipes, carries communicating therewith a lock, the parts of which are made tubular. The staple or keeper of the lock, through which the locking bar passes, is also made tubular. In front of each series of cells is arranged a cage, which is also of the same construction. The tubular system of each cell is connected by a pipe with pressure gauges, and an electric alarm operated by pressure gauges at the warden's office. In some cases a small longitudinal opening is left for the introduction of food.

The locks upon the doors are arranged to be operated by pressure, the bolts being pushed by a fluid acting upon a piston. Any retrograde movement of the piston, due to diminution of pressure, would be indicated at the warden's office upon the pressure gauge, and any considerable movement of this kind would result in giving an alarm upon the electric bell.

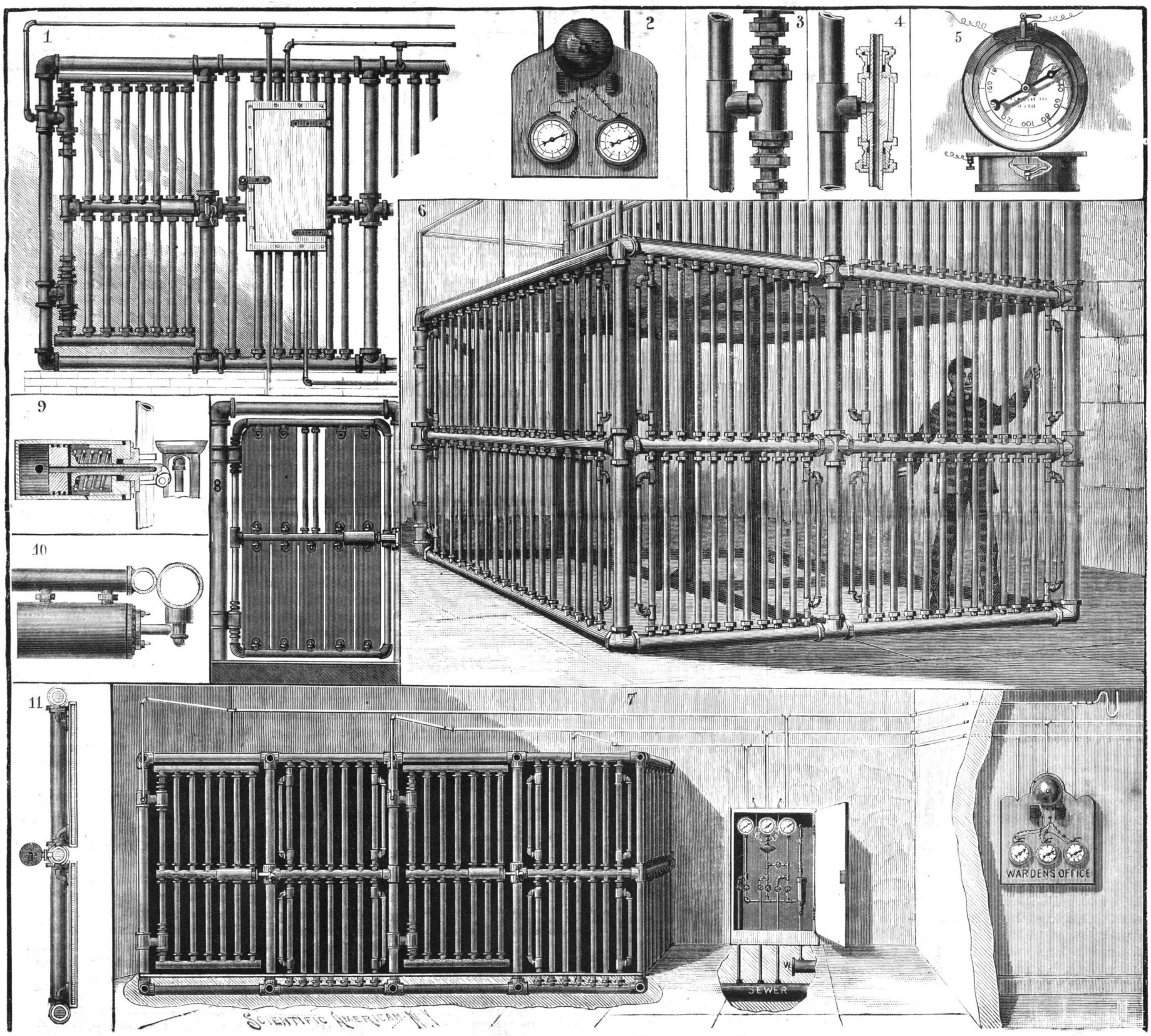
This system of protection, which is applied to prison cells and cages, has another application which is not less valuable than for prison walls, ceilings, and doors, that is, for safe deposit vaults, bank safes and vaults, etc., for the system of pipes is as effective in preventing entrance as escape, so that an unauthorized person could not gain entrance to a vault protected according to this system.

In Fig. 8, we show another system of construction, in which the cell is composed of a framework of piping, with hollow metal boxes connected to the piping and with each other, so as to form a solid continuous wall having a smooth, plane face.

The United States Treasury and Sub-Treasury might well adopt protection of this kind. The same principle carried out on a suitable scale can be applied advantageously to show cases containing valuables.

Fig. 1 of the engraving is a detail view, showing the construction of a large tubular cell door, with a portion of the cell structure, pressure cabinet, alarm gauges, etc., and Fig. 3 is an outside view of one of the tubular hinges, Fig. 4 being a sectional view of the same, showing the passages for supplying water to the tubular part of the door.

The pressure gauges and electric alarm apparatus are



GLAFCKE'S IMPROVEMENT IN PRISON CONSTRUCTION.

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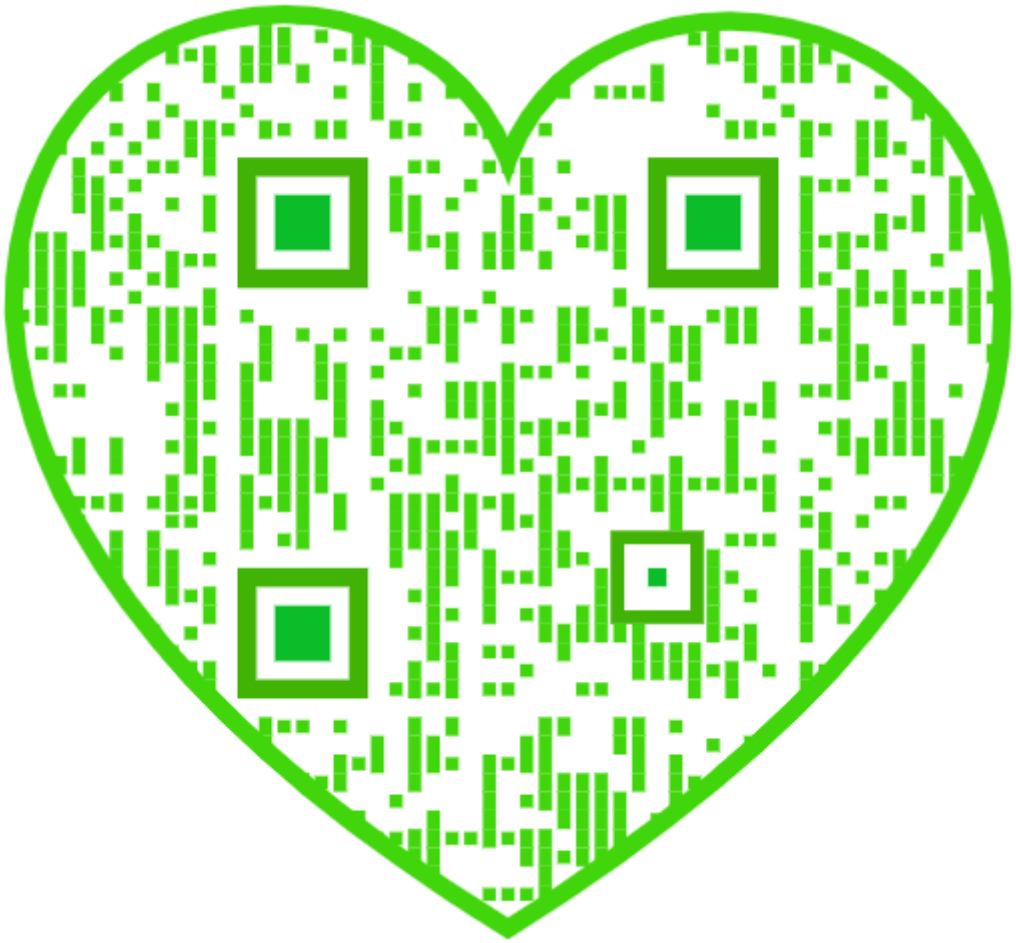

illustrated by Figs. 2 and 5, the latter showing the adjustable electrical contact arm carried by the spindle of the gauge behind the dial, and adapted to complete the electric circuit by engagement with a fixed contact piece. The details of the hydraulic lock are shown in Figs. 9 and 10. Figs. 8 and 11 show the hollow metal slab construction more particularly used in vaults, etc., while the remaining views show the complete jail structure ready for use.

It is obvious that this system may be applied to cells and vaults already built, or it may be placed around a cell block, whether it consists of modern steel cells or brick cells. In the application of this system to vaults and cells already in existence, the tubular walls may be erected around the whole structure, but the inventor prefers to place the tubular walls inside of the existing vault or depository.

This improvement in prisons is the invention of Mr. P. Emerson Glafcke, of Cheyenne, Wyoming. It is protected by patents both in this country and abroad, the patents being owned jointly by the inventor and Mr. T. A. Kent, a prominent banker of Cheyenne. This system has been approved by some of the foremost bankers, wardens and prison boards in the United States. Without doubt, the economy of construction and the effectiveness of the device will lead to its adoption where safety and protection are required.

Artificial Silk.

United States Consul Loomis, of St. Etienne, France, has recently sent to the State department a report giving information in regard to the Chardonnet process for converting wood pulp into what he calls silk. M. De Chardonnet has built a mill at Besançon, where the "silk" is now being manufactured.

The raw material is made from wood pulp, which is carefully dried in an oven and plunged in a mixture of sulphuric and nitric acids, then washed several times in water and dried by alcohol. The product thus prepared is dissolved in ether and pure alcohol, and the result is collodion, similar to that used in photography. This collodion, which is sticky and viscous, is inclosed in a solid receptacle, furnished with a filter in the lower end.

An air pump sends compressed air into the receptacle, and by its pressure the collodion is passed through the filter, which removes all impurities and flows into a tube placed horizontally. This tube is armed with 300 cocks, of which the spouts are made of glass and pierced by a small hole of the diameter of the thread of a cocoon as it is spun by the silk worm. The spinner opens the cock and the collodion issues in a thread of extreme delicacy (it takes six to make a thread of the necessary consistence for weaving). This thread is not, however, fit to be rolled on the spools, by reason of its viscosity and softness.

To produce the necessary hardness, the glass tube already mentioned is surrounded by a small reservoir, constantly filled with water. When the thread issues from the aperture in the manner described, it traverses this water, which takes up the ether and alcohol, and then the collodion becomes solidified; that is to say, it is transformed into an elastic thread as resisting and as brilliant as ordinary silk. The stuff manufactured was found to be dangerously inflammable. M. De Chardonnet has apparently removed this difficulty "by plunging the spun thread into a solution of ammonia, thus rendering it as slow of combustion as any other material."

The consul adds: "This discovery seems to have a great future. I have talked with great men, silk merchants, brokers, dyers, and men who manufactured silk goods, about the Chardonnet method of producing raw silk from wood, and it is universally admitted that the process will eventually yield large practicable and profitable results."

It is proper for us to add that this so-called artificial silk is a very different substance chemically from that produced by silk worms, and there is not likely to be any substitution of the one for the other in trade.

THE directors of the Grusonwerk of Magdeburg-Buckau, Germany, have issued a circular in which they state that the firm of Friedrich Krupp, of Essen, has obtained the right of working the enormous plant of the Grusonwerk. In return for this the Krupp firm guarantees a fixed annual dividend to the shareholders of the Grusonwerk. This combination is of great importance, as the two firms virtually control the armor plate manufacture of Europe. The Gruson factory manufactures not only guns of all sizes, from small quick fire guns up to large size cannon, but they also make all kinds of armor, armored turrets, gun carriages, ammunition, etc. The Grusonwerk has been equally successful in the peaceful arts, and it manufactures a large variety of metallurgical and mining machinery, hydraulic machinery, gas engines, distilling plants, railway material, etc. The enormous factory at Magdeburg-Buckau contains 75 steam engines, 1,100 machine tools, 10 steam hammers, including one of 100 tons, 18 cupolas and 29 open hearth furnaces.

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AGRICULTURAL RAILWAYS.

A large body of farmers have united in Kansas for the purpose of building an electric railway across the prairies to enable them to ship their cattle and other products to market, and thus put a million of dollars or more which they now claim to spend annually in transportation into a road which they themselves shall own. The scheme is a pretentious one, more pretentious than the present knowledge of electrical matters and the courage of the financial world would warrant, because the road as proposed is five hundred miles or more in length. Nevertheless a committee has been in Chicago investigating the matter with a view to adopting the storage battery or the trolley system, whichever one seems best adapted to the purpose.

Even if these farmers are somewhat ahead of the times in their purposes, they are foretelling what is soon to take place. At the present rate of electric railway building most of the larger towns and cities which have passenger traffic in sufficient volume to support an electric railway system will be well supplied in this particular in three or four years at the outside. When this field is well covered it is hardly probable that manufacturers of electric railway apparatus will give up the manufacture of a line of material of such unquestioned economic value as theirs, and they will extend their business in other directions, and the transportation of freight would naturally be the desired, in fact is the only, direction which gives promise of satisfactory financial returns. Several electric railways in various parts of the country already do a considerable business in the line of carrying freight, but the possibilities in this direction are by no means fully demonstrated yet. A great necessity in any inhabited section of country is good roads over which the products of the earth can be economically transported to market. In this respect our country is sadly lacking, and the farmers of Kansas and other Western States know how to appreciate this when oftentimes they use the corn they have raised for fuel because excessive freight charges make it impossible for them to ship it East and receive remunerative returns.

The scheme of the Kansas farmers to build an electric road is not so harebrained as it might be by any means. Such electric roads will not take the place of trunk lines of steam roads any more than electric light has taken the place of gas. One supplements the other. A few such electric roads for purposes of transporting freight, if built with regard to commercial needs, would prove valuable feeders to the steam roads and increase their amount of freightage.

When Edison Was Young.

"I was an operator in the Memphis office when Thomas A. Edison applied to the manager for a position," said A. G. Rockfeller, a member of the Reminiscence Club, St. Louis. "He came walking into the office one morning looking like a veritable hayseed. He wore a hickory shirt, a pair of butternut pants tucked into the tops of boots a size too large and guiltless of blacking. 'Where's the boss?' was his query as he glanced round the office. No one replied at once and he repeated the question. The manager asked him what he could do for him, and the future-great proceeded to strike him for a job. Business was rushing and the office was two men short; so almost any kind of a lightning slinger was welcome. He was assigned to a desk and a fusillade of winks went the rounds of the office, for the 'jay' was put on the St. Louis wire, the hardest in the office.

"At this end of the line was an operator who was chain lightning and knew it. Edison had hardly got seated before St. Louis called. The new comer responded and St. Louis started in on a long report, and he pumped it in like a house afire. Edison threw his leg over the arm of his chair, leisurely transferred a wad of spruce gum from his pocket to his mouth, picked up a pen, examined it critically, and started in, about 200 words behind. He didn't stay there long, though. St. Louis let out another link of speed, and still another, and the instrument on Edison's table hummed like an old-style Singer sewing machine.

"Every man in the office left his desk and gathered round the 'jay' to see what he was doing with that electric cyclone. Well, sir, he was right on the word, and was putting it down in the prettiest copperplate hand you ever saw, even crossing his t's, dotting his i's and punctuating with as much care as a man editing telegraph for 'rat' printers. St. Louis got tired by and by and began to slow down. Edison opened the key and said, 'Here, here! this is no primer class! Get a hustle on you!' Well, sir, that broke St. Louis all up. He had been 'raw hiding' Memphis for a long time, and we were terribly sore, and to have a man in our office that could walk all over him made us feel like a man whose horse had won the Derby. I saw the 'wizard' not long ago. He doesn't wear a hickory shirt nor put his pants in his boots, but he is very far from being a dude yet."—*Practical Electricity.*

THE Minot Ledge lighthouse is of granite; height, 88 feet, the lower 40 feet being solid.

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Notes from the World's Columbian Exposition.

The chiefs of departments at the World's Columbian Exposition recently held a protracted meeting, at which they fully discussed the progress of completing the buildings and of installing exhibits. The condition of each department was fully discussed and the needs of some were considered, in order that they might catch up with others that are well along. After the whole situation had been fully analyzed, it was the general opinion of the meeting that if exhibitors are prompt in sending in their exhibits and energetic in installing them, there is no reason why the Exposition should not be opened on May 1 in most excellent condition.

A glance at the way work is being pushed now will show that no time is being lost. As many men are employed as can possibly be made use of. The great Manufactures and Liberal Arts Building resounds to the echo with the sound of driving nails and sawing lumber, with the rumble of freight cars which are bringing in cases of exhibits, and the tread of horses drawing truckloads of exhibits and lumber. The Japanese pavilion is completed and makes a very attractive show with its Oriental style of architecture and its bright colors. Several prominent manufacturers have nearly completed their pavilions, and Great Britain, Germany and France are well along with their work. The Austrian pavilion has just been laid out, while Canada, Denmark, Brazil, the Netherlands, Spain, Italy and other nations are fast bringing their pavilions into attractive shape. Staff is quite extensively used in ornamenting these pavilions, thus giving a more finished effect than was generally seen at the Centennial Exposition.

In the Agricultural Building a dozen or more State pavilions are nearly completed and give promise of very interesting displays, particularly in the line of natural woods, corn, grain and other products. In the Palace of Mechanic Arts the work of completing the building and of installing the power plant goes on side by side with the building of pavilions and installing of exhibits. In the Electricity Building several of the larger and more important of the exhibitors have already done considerable work. Workmen are now preparing for an exhibit in this building which will attract much attention. This will be a subterranean mine, completely fitted with electric mining machinery. In the Mining Building more has been accomplished proportionately toward completing the work of installing exhibits than perhaps in any other building. In the Transportation Building there is a good showing of work, and every day brings a change from the previous one. In Horticultural Hall a large number of men are at work on the flower and plant exhibits, and work has been begun building an immense mound under the dome. Within this mound there will be a perfect model of a cave recently discovered in the Black Hills. The stalactites and stalagmites for use in this cave are already on the ground. The Women's Building, although one of the first structures completed, is somewhat behindhand, as no exhibit has yet been installed.

Work on the State buildings is nearly up with that on the Exposition buildings proper, and quite a number of the State buildings are completed. The North Dakota building is having put in place a fine exhibit of the State products, and the building is quite elaborately trimmed in the interior with corn and other native products. In the Kansas building is a fine display of animals, both wild and domestic, and also a showing of the State's products. These animals are exhibited by the State University. Iowa is making a very elaborate show, after the style of the corn palaces which have been built before in that State. The building is finely located at the extreme northeastern corner of the grounds on the lake shore, and the large hall is elaborately decorated with corn. There are cross sections of ears which are nailed on the wall in quite elaborate patterns, the background being some bright color; while under the roof are long festoons of ears of corn, while bundles of grain and other native products are displayed with fine effect. There are, as yet, no exhibits in any of the other State buildings, but the buildings of the following States have been completed: Wisconsin, Ohio, Colorado, South Dakota, Nebraska, Arkansas, West Virginia, Utah, Montana, Maryland, New Jersey, Connecticut, New Hampshire, Maine, Virginia, Massachusetts, Rhode Island, Delaware, New York, Pennsylvania, Florida, Louisiana, Illinois, and Minnesota. The Virginia building, which is an exact representation of Washington's home at Mount Vernon, attracts much attention from visitors. The Massachusetts building is a fine reproduction of an old colonial mansion. The codfish weather vane attracts the Western eye. The New York building is a large, imposing structure, and is perhaps the most pretentious of any of the State buildings. The Florida building is unique and interesting, being a reproduction of the old fortification at St. Augustine. Considerable work yet remains to be done on the buildings of the following States: California (a reproduction of the old mission station at Santa Barbara), Indiana, Michigan, Washington, Texas, Kentucky, Idaho, Vermont, Missouri, and the Territorial buildings of New Mexico, Arizona, and Oklahoma.

The Bureau of Music is laying out a programme that will cover the whole period after the Fair is opened until the close. The scheme upon which the programme is based contemplates outdoor music by the finest bands of America and Europe, so arranged that there shall be plenty of music each day. In addition to this it is proposed to have concerts every day, and society and festival concerts every week, in which leading organizations from all parts of the country will participate. Every conductor and society of note throughout the country has been assigned a definite time for furnishing music. The concerts proper will be held in Music Hall, while the bands will play in outdoor pavilions.

There will be no high tower at the Exposition to compare with the Eiffel tower that was built for the Paris Exposition, but some grand vistas have been provided for, one of the last being a promenade on the roof of the Manufactures and Liberal Arts Building. The concession has just been granted and contract awarded for four elevators to carry the passengers up to it. This roof is 237 feet high, and will command a grand view of the whole Exposition. The top of the dome of the Administration Building is some 30 feet higher, but does not have the area to accommodate people. Provision is also made on two other buildings at least for visitors. These two buildings are the Transportation Building, which will have a restaurant on the roof over the golden entrance, as has been stated before in these columns, and the Women's Building, which will also have a restaurant on the roof. The concession for this last restaurant has just been awarded to a woman.

Mr. Frederick Sargent, who was made general manager of the combined electrical and mechanical departments only a few weeks ago, has handed in his resignation, and it has been accepted. Mr. Sargent has served the Exposition faithfully, and much credit is due him for the efficient and comprehensive manner in which the power plant has been laid out.

The number of visitors within the Exposition gates has become quite a burden, now that work is being so rushed, and in order to restrict if possible the multitude, the price of admission has been increased from twenty-five to fifty cents, and the desired result seems to have been accomplished, for the time being, at least.

The White Horse Inn, made so famous by Dickens, has been reproduced in staff, and an immense white horse has just been put in position over the entrance way. This building is to be formally dedicated by Dickens' admirers on May 10. The building is to be headquarters of the Columbian Pickwick Club.

All crafts or vessels run in connection with the World's Columbian Exposition will fly two flags, the national flag and the Columbian maritime flag. The maritime flag is of white bunting with a wreath of oak leaves in the center, with a blue anchor in the center of the wreath. The gondolas will fly a flag modeled after those used in the fourteenth century. The lagoons, basin, and other interior waterways have all been dredged so that six feet is the minimum depth. This provides ample waterway, as the launches and other small boats will not draw over three feet. The fire boat which was built last year for use at the Exposition, and which has lain in the canal all winter under steam, to be ready for service at an instant's notice, draws so little water that it can run in any part of the waterways. A covered way designed only for the use of the fire boat gives it entrance from the basin into the South canal.

An interesting memorial of the Exposition is being prepared which is to be placed permanently in the Art Institute of Chicago. This will comprise the models for much of the art work at the Exposition, including the statues, reliefs, and paintings.

One vote out of a total of sixty-one has stemmed the tide of a threatened strike of switchmen on the railroads focusing at Chicago. Had the strike taken place the World's Columbian Exposition would have been seriously injured, so far as its financial success is concerned. The escape was very narrow, but was only one of many vicissitudes through which the Exposition has passed. In most other instances it has had to make the best of untoward circumstances, and considering all these circumstances it is a wonder that the Exposition has not been badly shaken. More obstacles have been thrown in the way by those who should have been its best friends than the general public is aware of. This is true with labor, and the fact that the switchmen's strike has been, for the time at least, avoided is a relief. Labor organizations have demanded all the work to be done upon the grounds and buildings, and whenever there has been a remonstrance at unjust demands, there have been immediate threats of a strike and boycott. If there could have been harmony instead of antagonism between labor and the Exposition officials, all work, so far as the buildings and grounds are concerned, could have been completed some time ago. But with an eight hour working day and almost prohibitive prices for overwork or night work, while thousands of men have been idle in all our large cities, it has been imposible to accomplish more than has already been done. But the laboring man has not been the only one that has hampered the efforts of the Exposition officials. Congress has not been over-generous in its support, financial and otherwise, and one or two railroads have endeavored to wring excessive charges out of the Exposition, while combinations in the business world have in several instances endeavored to make enormous profit out of the Fair. And perhaps most surprising of all, the local press has made occasional virulent attacks on the Exposition which have not had the slightest foundation in truth or fact.

In short, the Exposition has had very little cordial support from many upon whom it most depends for success. It has had from the first to fight off barnacles of one sort or another.

An Important Patent Decision by the Supreme Court.

A ruling upon the validity of patents granted in the United States under foreign patents of the same invention was made by the Supreme Court of the United States March 27, in the case of Henry Huber et al. agt. the N. O. Nelson Manufacturing Company, appealed from the Circuit Court for the Eastern District of Missouri. Mr. Justice Blatchford delivered the opinion. A patent for an "improvement in water closets" was issued April 7, 1874, in Great Britain. The patent was to run for fourteen years, with a proviso that if a stamp duty of £100 was not paid within seven years of date of issue, the patent would at the expiration of that term become void. Application for a patent in the United States under assignment was made November 29, 1881, and the patent granted June 27, 1882. The £100 stamp duty was not paid in Great Britain within the time required, and the patent there became void April 7, 1881. Under these facts the circuit court held that the patent granted in the United States was void, because it was granted after the British patent had ceased to exist, and judgment to this effect in favor of the defendants was affirmed. This decision, it is believed, destroys Edison's quadruplex telegraph patent and also his three microphone patents, which were not patented here until after the foreign patents had been taken, leaving the Bell company, after January next, to stand wholly on the Berliner patent.

The New American War Ship New York.

Within a few weeks the United States navy has had enrolled in its ranks as a reserve ship the New York of the American line. Almost coincidently with this event, which meant the securing of the fastest ships afloat, to be used if necessary in war, came the account of the unofficial trial trip of the new armored cruiser New York, which has just been finished at the Cramps' ship yard, in Philadelphia. The trip showed that the namesake of the naval reserve ship resembles or perhaps surpasses her in one respect—in speed the new cruiser appears to rank among the fastest ships of her class.

On Tuesday, March 21, the ship left Cramps' yard and proceeded down the Delaware, under her own steam, attaining about 17·5 knots, and anchored near the breakwater. On Saturday, March 25, the ship was taken out to sea. Two runs were first taken from five fathom lightship to northeast end lightship and return. The first run to the northward took 29 minutes 38 seconds, the second run to the southward took 29 minutes 51 seconds. The distance covered in each run was 9·88 nautical miles, giving rates of 20·03 and 19·87 nautical miles per hour. Next the ship was run out to sea into deeper water. Basing her record on the data obtained from the two distance trials, on a four hour run, a speed of 20·38 nautical miles per hour was maintained. As the water deepened, a speed of 20·57 miles was reached.

Metallic Tin on Cloth.

A new process, invented in Germany, allows a brilliant and flexible stratum of tin to be deposited upon cotton fiber. A paste is first made of the powdered zinc of commerce and white of egg and spread on the material by means of a brush. This is then coagulated after drying by a current of superheated steam and the tissue is then introduced into a bath of perchloride of tin. The metal precipitates on the zinc in a finely divided state, and after rinsing and drying the cloth, it is passed through cylinders or calenders which give brilliance to the coat of tin. Beautiful metallic designs may be obtained in this way. It is stated that the process may be substituted entirely for the ordinary method of ornamenting cloth with tinfoil.

A New Commissioner of Patents.

John S. Seymour, nominated to be Commissioner of Patents, is a lawyer, 45 years of age, and a resident of Norwalk, Conn. Two years ago he was elected State Senator, which was his first public service. He is reputed to be a man of much ability and doubtless will make an efficient Commissioner of Patents.

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SIMPLE SLIDE CHANGER AND ECLIPSER.

BY GEO. M. HOPKINS.

With perhaps the single exception of the photographic camera, there is probably no instrument of which so many different grades can be found as of optical lanterns, ranging as they do from the poor toy article with a candle for a light, up to the magnificent optical lantern employing electricity as an illuminant and costing hundreds and in some cases thousands of dollars.

The apparatus here described is not designed for use with either of these extremes, but is intended for a good single lantern used for projecting photographic shades.

One does not need to be an adept in lantern matters to know that half the effect is lost when the slides are passed through the field in successional order; and while the superb effect secured by two or more lanterns and dissolving apparatus cannot be produced by a single lantern, slides can be changed, without making the movements visible on the screen, by means of an eclipser, which will momentarily shut off the light while the slide is being moved.

Several varieties of apparatus for this purpose have been devised, most of them being complicated and expensive.

The engravings show a simple device which is effectual in accomplishing the desired result, and if entirely home made the cost is very small indeed.

The principal part of the device consists of a wooden slide changer which may be purchased for a small sum from any dealer in optical lanterns, or it may be readily made by any one who is handy with tools.

The frame forming the fixed part is of the right size exteriorly to fit into the lantern. The opening through the frame is the same as that of a lantern slide mat. To this frame is fitted a slide having two pockets, one at either end, for receiving slides; the openings in the slide are larger than those of the fixed frame. In the bottom of each pocket is pivoted a brass lever, and in the outer end of each pocket is a space containing a vertical wooden rod, the lower end of which rests upon the shorter arm of the lever while the upper end projects above the slide and forms a stop for limiting the motion of the slide. The pressure of the finger on the top of the wooden rod, as shown in Fig. 2, starts the slide from the pocket, so that it may readily be removed and replaced by another. Both pockets are seen in Fig. 1, which shows the operation of changing.

To the lower part of the front of the fixed frame is hinged a shutter made of vulcanized fiber, and through the shutter, about one-half inch above its lower edge near opposite ends, are made holes, and in the fixed frame opposite these holes are bored oblique holes for receiving the shutter-operating cord, which passes along the outer surface of the slide, through the holes in the frame and shutter and along the outer surface of the shutter between the holes. The ends of the cord pass through holes in the wooden strips secured to the sides of the slide at its ends, and each end of the cord is provided with a shoe button for a handle.

To the fixed frame, near one of the hinges of the shutter, is secured a thick piece of felt, which serves the double purpose of preventing the shutter from closing against the frame, so as to allow it to readily fall open when released, and of preventing noise.

In Fig. 2 a picture is being exhibited through the opening of the fixed frame, while slides are being changed in the other part of the apparatus. By drawing on the button at the right hand end of the side slide the first operation is the closing of the shutter, the second is the shifting of the view while the shutter is closed, the third operation is the falling of the shutter on the release of the cord, and the exposure of the second view.

The cord used is the finest and strongest silk fish line, and, to insure smooth action, the cord is coated with black lead.

To insure sufficient friction of the slide to prevent it from being moved until after the shutter is closed, a small steel spring is inserted between one of the upright bars of the fixed frame and the slide, as shown in Fig. 3.

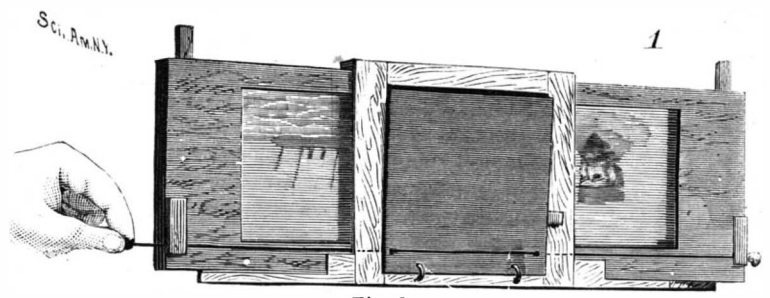


Fig. 1.

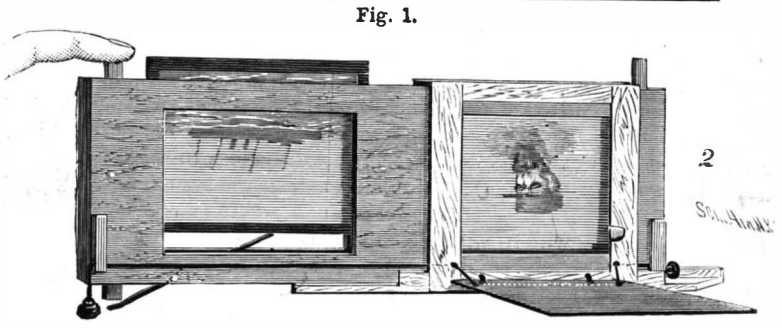


Fig. 2.

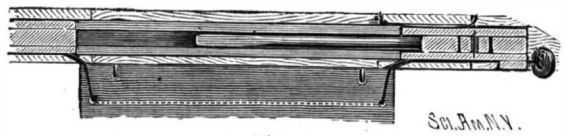


Fig. 3.

SIMPLE SLIDE CHANGER AND ECLIPSER.

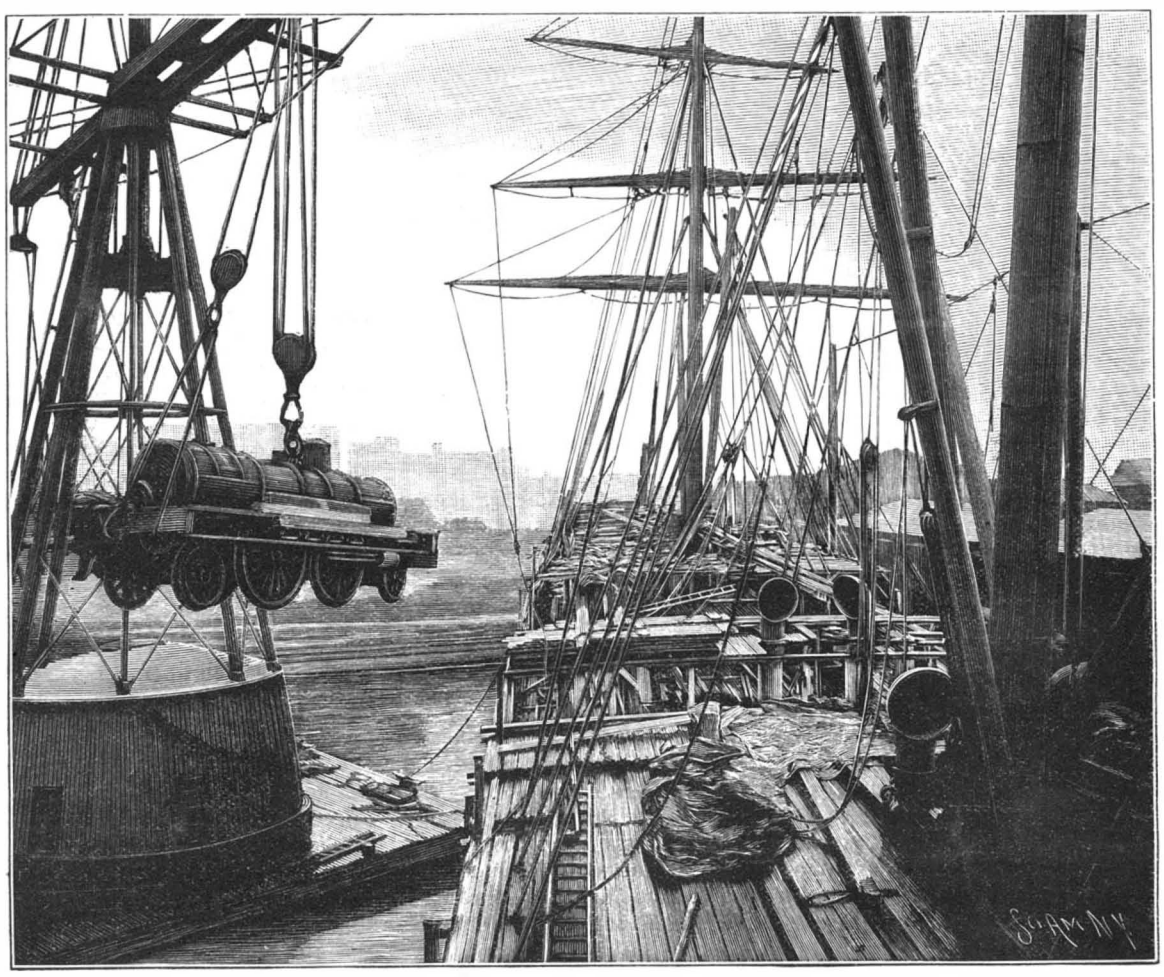
ENGLISH RAILWAY EXHIBIT FOR CHICAGO.

Our illustration, from a photograph, represents one of the largest locomotives ever built in England, on its way to a place in the World's Exposition at Chicago. The engine constitutes a portion of the exhibit forwarded by the London and Northwestern Railway, and was hoisted from the ship which brought her across the ocean to one of the huge lighters so much used in New York harbor for transporting railway cars. The exhibit was forwarded to Chicago by the New York Central Railway, and consisted, besides the engine, of two passenger coaches and a number of smaller models and railway appliances.

The locomotive is named the Queen-Empress, is 32 feet long and weighs 47 tons, the tender being 15 feet long and weighing 13 tons. There are four driving wheels, each 7 feet 6 inches in diameter, and she is said to make over 90 miles an hour.

The passenger coaches are built according to the latest English patterns, and will be quite novel as compared to American vehicles of like character. One of the cars is a day coach and the other a sleeper. They are called saloon vestibule cars, and are entered from the sides instead of the ends. The interior of the sleeper is fitted up with compartments to contain fourteen people each. In each compartment is a toilet room. There is also a smoking room and compartment for the attendant. Both cars are painted a chocolate color up to the windows. Above that the color is white. The interior of the sleeper is fitted up in satin and walnut woods, and the upholstering is in dark plush. The car is heated by a gas stove and provided with gas and electric lights. The day coach is a composite car, arranged to accommodate first, second and third class passengers.

Along with the train are several other exhibits of the English company, the most important being an exact reproduction of the old locomotive Rocket, the first successful engine built by George Stephenson, and first operated on the Liverpool and Manchester Railroad in 1829. There is also a model of the mogul type, called the Dreadnaught, which is the first compound engine to be operated in England. The entire exhibit of the London and Northwestern Railroad cost $50,000, and will occupy 2,800 square feet of space.



UNLOADING A LARGE ENGLISH LOCOMOTIVE AT NEW YORK.

Magnetized Chain Wheels for Towing.

An interesting application of electro-magnetism has recently been made in France in the industry of chain towing, which is extensively carried on on some of the large European rivers. The several turns of the chain on the towing drum necessary to get the proper adhesion has been the chief cause of deterioration and rupture, and this fact, together with the difficulty of properly paying out the chain in rounding bends, especially where it is used in ascending the stream only, has directed attention to improvement in these matters. The experiments conducted by the Société de Touage de la Basse Seine et de l'Oise upon the River Seine have culminated in the construction of a large tow boat, whose towing apparatus contains several magnetized pulleys.

The main towing pulley is but a little over 4 feet in diameter. It is simply a solenoid, whose soft iron coil is flanged to form the groove, the bottom of which is a bronze ring with rubber joints to prevent the wire coil from getting wet. The current is generated by a small dynamo. The whole construction is simple and very strong, and besides the advantage of having a small towing pulley there is the much greater one that the proper amount of adhesion is obtained with only three-quarters of a turn. A similar magnetized pulley acts as a brake on the slack of the chain, enabling it to be properly and regularly paid out. It is hoped that these improvements will render chain towing practicable on rivers when the rapidity of the current or the crookedness of the stream has hitherto prevented its adoption.

Paint for Racers.

When the Galatea was over here, she was hauled out for the purpose of having her plates smoothed down and coated for the international races. This occupied three days, for first of all she was sandpapered all over, and every crack and flaw in the cement was filled up. Then over the paint were put two coatings of gold size, and in the last coat black lead or pot lead was mixed. When all had set hard the surface was polished with brushes. The result, of course, is perfection so long as it keeps clean, but weeds grow very quickly upon it. In point of fact, Galatea began to foul within a fortnight. It is said a good plan is to mix the black lead in a bucket with the white of eggs, beating the latter well up beforehand.

GUNTER'S chain, used in measuring land, was invented by Edmund Gunter in 1606.

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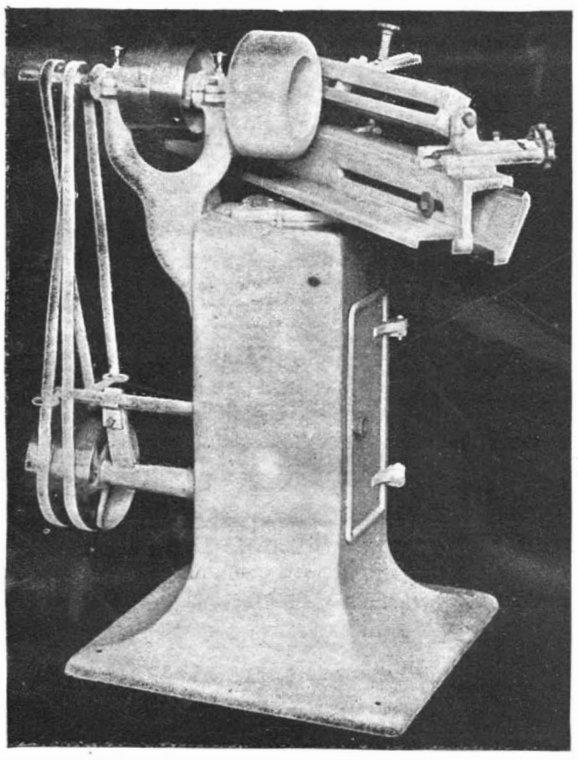
AN AUTOMATIC KNIFE GRINDER.

The knife grinder shown in the illustration, for which a patent has been applied for, has many admirable points recommending it for adoption in all well appointed mills and factories, chief among which is the fact that it is readily adjustable for flat or concave grinding. By slacking one bolt the slide or bed can be set at different angles before the emery wheel, which has a flat face with the outer corner rounded off.

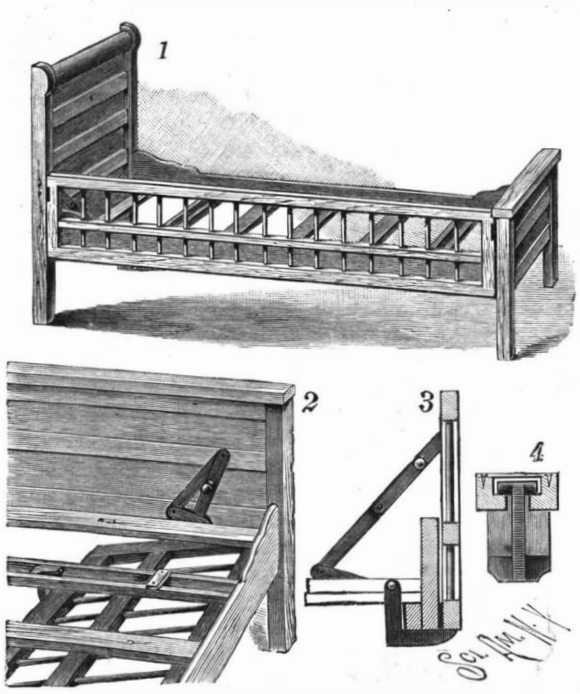


THE BUFFALO PLANER KNIFE GRINDER.

Setting the bed at a right angle to the wheel spindle, the knife travels back and forth against the flat face of the wheel and is ground a flat bevel, while, when the bed is set at another angle, the rounded corner of the wheel does the grinding, making a concave bevel. In this way a flat, stout edge is readily obtained for rough work, and a thin concave edge for fine work. The shifting of the belts that drive the bed back and forth is effected by bell cranks inside the pedestal, the arrangement being such that the bed can be adjusted at different angles without affecting the belt-shifting operation, and permitting the swinging of the bed while the machine is in motion. The machine, after starting, requires little or no attention, the carriage having an even back and forth traverse, and reversing without noise or jar. The shafts are steel and run in babbitt boxes, and all the work is done by first-class workmen. These machines are manufactured by Messrs. Samuel C. Rogers & Co., of No. 27 Lock St., Buffalo, N. Y.

AN ATTACHMENT FOR BEDS.

A safety device to prevent children from falling out of an ordinary bed is shown in the picture, the device being readily removed from the side of and swung



WIERENGA'S ATTACHMENT FOR BEDS.

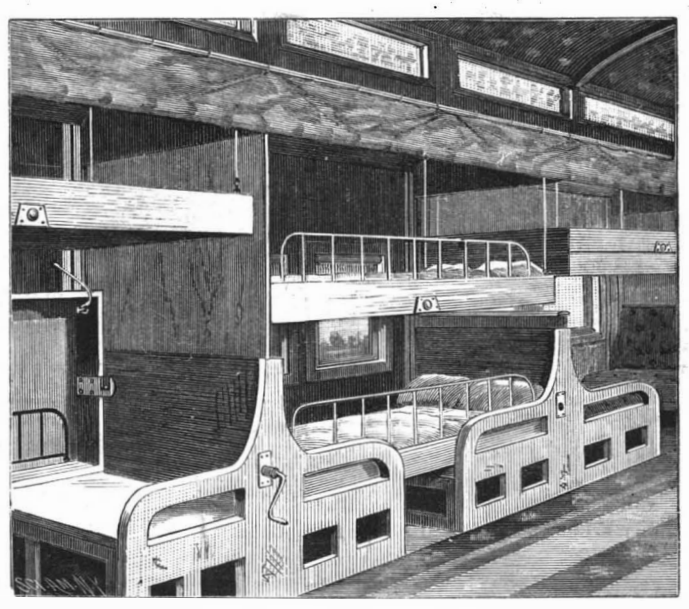
under the bed when not in use. The improvement has been patented by Mr. A. C. Wierenga, of Zeeland, Mich. Fig. 1 represents the attachment in position at the side of the bed, and in Fig. 2 it is seen swung below the bed slats. The side frame is held to the slats by two or more hangers, which form an adjustable connection of the frame with the bedstead. The hangers are somewhat L-shaped, Fig. 4 showing a plan view, while in Fig. 3 may be seen a side view, and they each have on one limb cross pins which engage and slide freely in a slot in the top side of a bed slat. The other limb of the hanger is rigidly connected with the bottom rail of the frame. On the headboard and footboard of the bedstead are folding braces to support the frame at the ends when it is in use as a guard, as shown in Fig 3, the end link of each brace hooking on a stud on each end of the frame. When the frame is not in use, and is swung below the bed slats, it is held in a nearly horizontal position by a simple support attached to the botton of the bed side rail, the attachment being then completely concealed from view.

New Solder for Aluminum.

Aluminum is soldered with the alloy given below, with the ordinary tinman's soldering iron, or with the blowpipe. It does not oxidize or discolor the metal. The following solders are employed for aluminum: No. 1—Pure tin; melts at 250°. No. 2—Pure tin 1,000 parts, fine lead 50 parts; melts at from 280° to 300°. No. 3—Pure tin 1,000 parts, pure zinc 50 parts; melts at from 280° to 300°. These three solders may be used in the manufacture of aluminum trinkets. For the following two solders the soldering iron should be made of pure nickel. No. 4—Pure tin 1,000 parts, pure copper 10 to 15 parts; melts at from 350° to 450°. No. 5—Pure tin 1,000 parts, pure nickel 15 parts; melts at from 350° to 450°. No. 6—Pure tin 900 parts, pure copper 100 parts, bismuth 2 to 3 parts; melts at from 350° to 450°, and is recommended for soldering aluminum bronze.—*J. Novel, Chem. News.*

AN IMPROVED SLEEPING CAR.

In the car shown in the illustration, one or both berths may be elevated to the roof of the car, and there held until needed, giving a maximum of head room over the seats, while the lower berth may be elevated from its support upon the seats to a vertical position in engagement with the sides of the car, enabling the seats to be used in dressing, and affording room for convenient movement. The car also presents various other novel features. It forms the subject of a patent issued to Mr. William Sneckner, Hotel Winthrop, 125th Street and Seventh Avenue, New York City. Over each lower fixed partition separating the sections is a fixed partition secured to the sides and roof, the latter partition holding a sliding panel which is concealed in the lower partition when the car is in use as a day coach. The panels are moved by attached cables carried up over pulleys near the top of the car, and in a chamber formed between the outer and inner walls, a weight being secured to the free end of each cable. By the aid of the weights the panels are readily carried up, to render each section private. A fixed curtain at the top, in connection with the upper partition, forms a compartment in which both the upper and lower berths are located when not in use. The lower berth when in use rests upon two seats, but the upper berth is suspended by four cables, one at each corner, the cables being carried up over pulleys in the upper chamber, and thence to a cable connection with a drum upon a shaft adapted to be rotated by means of a crank. By means of a novel form of latch bars the lower berth may be readily connected with the upper one, to be carried within the upper compartment of its section when not in use. The front sections of the seats are hinged at their lower edges to drop downward, and the seat bottoms are removable, and when a lower berth is to be made up the seat bottom is placed in the space normally beneath the seat, and the hinged back of the seat is let down, presenting a table-like surface upon which the lower berth is supported. To hold the lower berth up out of the way, and thus afford room for moving about, a cable having a weight at its outer end is passed through an opening in the side wall of each section, near the end wall, the cable being passed over pulleys, and having at its inner end a hook. By attaching these hooks to pins at each end of the lower berth, the latter is readily raised to and held in a vertical position, as shown in the representation of one of the sections.



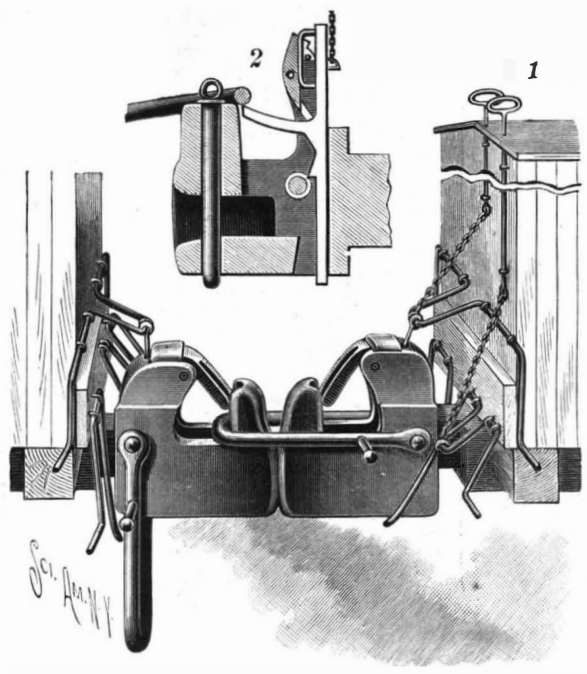
SNECKNER'S SLEEPING CAR.

Utilization of Molasses.

Hitherto it has been found impossible to extract the crystallizable saccharose from molasses, because the substances associated with it prevented crystallization. Messrs. Scheering have now found that by convering it into dextrose and lævulose by inversion and then heating with lime, the calcium compound of lævulose obtained by Dubrunfaut from pure invert sugar may be separated from the molasses in a state of perfect purity. By decomposing this calcium compound with carbonic acid a pure lævulose solution may then be obtained, the whole of the coloring material and other adventitious substances being retained with the lime compound of dextrose.—*Pharm. Centralb.*

AN IMPROVED CAR COUPLING.

By means of the coupling shown in the illustration, the cars upon which it is applied will be automatically coupled as they come together, and may be readily uncoupled from either the sides or top of a car. The improvement has been patented by Mr. J. Lawrence Smith, of Ogden, Utah Ter. Fig. 1 shows two cars coupled by the device. The drawhead is supported in the usual manner, and is adapted to slide in the car end, and on its front end is an upwardly projecting limb, rearward of which are two vertical flanges on the drawhead body, within which is pivoted a guard plate.



SMITH'S CAR COUPLING.

Upon the exterior of the flanges a bail coupling link is pivoted by its ends, the bow portion being adapted to engage the forward limb of the coupling of an approaching car. The guard plate is vertically slotted at its rear, a link-lifter bar working through the slot and through a slot in the drawhead, and a forwardly projecting arm on the lifter bar is connected with a coupling pin, adapted for use with an ordinary coupling link. The lifter bar is also adapted to engage the guard plate, rocking it to allow a coupled engagement of the limb with the bail loop of an approaching coupling, so that the coupling may be effected automatically when the cars come together.

A preferred means of lifting the coupling link into elevated position, ready to fall forward and engage with another coupler, is by means of rockshafts on the end of the car, an arm on the shaft engaging a stud on the link. The shafts may be operated by a rod extending to the top of the car or by a crank at the side, and another rock shaft is similarly operated to uncouple the link. For automatic coupling the link is raised to a virtually upright position, inclined slightly backward, and the shock of the cars coming together throws the link forward over the draft limb of the other coupling, the lifter bar at the same time dropping and throwing the guard plate over the link. In Fig. 2 is shown a modified form of the coupling, the change consisting partly in the formation of the forward limb, down through which passes the coupling pin. The coupling link is also somewhat differently formed to facilitate the coupling together of cars of different heights. Further information relative to this improvement may be obtained by addressing the J. Lawrence Smith Car Coupling Co., J. H. MacMillan, Secretary, Ogden, Utah Ter.

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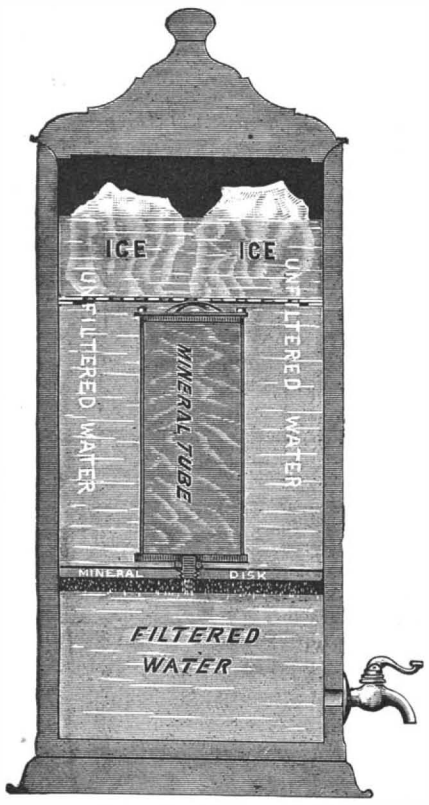
GERM-PROOF WATER FILTER AND COOLER.

A filter so inexpensive that it is designed to find a place in every family, and which can be kept entirely clean and sweet without being taken apart and joints broken, is shown in the illustration, which represents a combined cooler and filter. This filter is designed to free water from microbes and all suspended matter



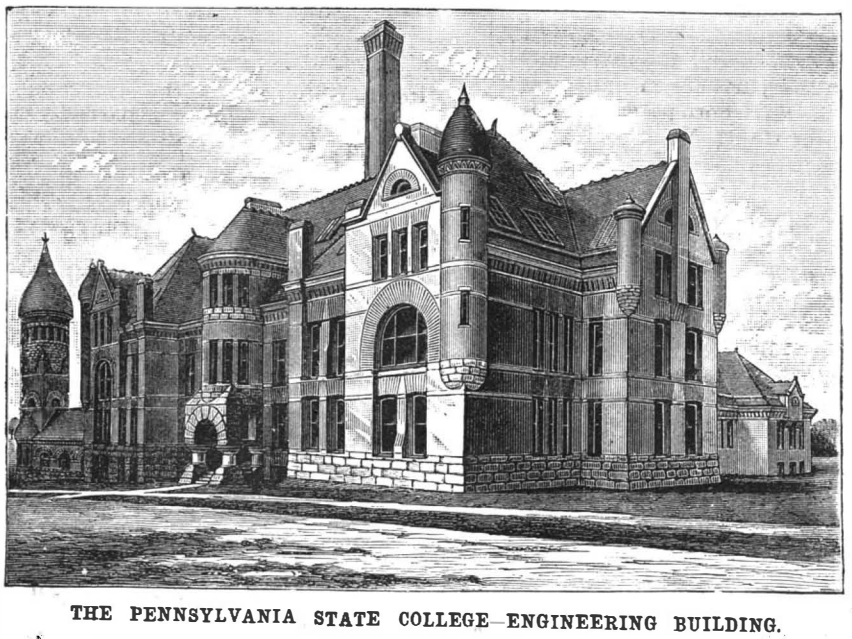
THE McCONNELL FILTER.

and disease germs, and is highly indorsed by the medical fraternity for this purpose.

It has a large porous tube made of exceedingly fine mineral flour. The water is filtered by passing through the minute pores of the cylinder to the compartment below. The impurities are all retained on the outer surface of the cylinder, from which they are easily washed. The ice is placed on a grate in the upper part of the unfiltered water chamber, and when this grate is removed the cylinder can be taken out to be washed, or it may be washed in its place either by being flushed or by brushing its surface. These filters are also made in another style to be attached to pipes by which water is supplied under pressure, and they are in each case made in various sizes to furnish any desired quantity of water. They are manufactured by the McConnell Filter Co., of Buffalo, N. Y.

THE NEW ENGINEERING BUILDING OF THE PENNSYLVANIA STATE COLLEGE.

The Pennsylvania State College is situated at State College, Center County, Pa., and was founded in 1859. Recently the college has grown rapidly and the new engineering building, which was dedicated February 22, 1893, will soon enable it, we hope, to attain a high

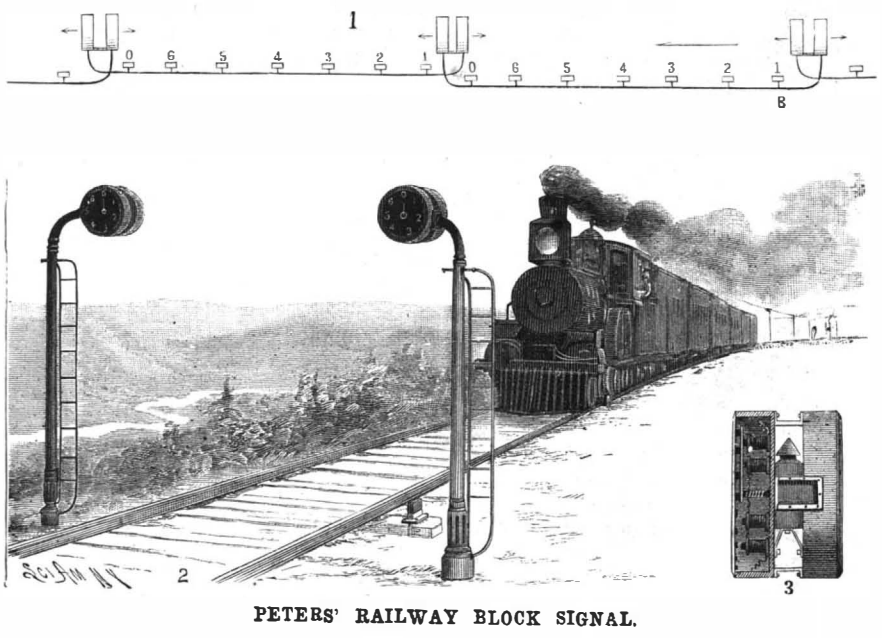


THE PENNSYLVANIA STATE COLLEGE—ENGINEERING BUILDING.

place among the technical institutions of the United States. The building itself is built of red pressed brick with brown stone trimmings. Although the architecture of the building is not above criticism, still on the whole the effect is very pleasing. The main building is three stories in height and the entire group measures 266 by 208 feet, so that it will readily be seen that the effect when viewed from the campus is imposing. The interior arrangement is admirable, and shows much forethought on the part of both the architect and the professors. The basement contains the machinery, etc., including machines for testing the strength of materials, the value of lubricants, cement, etc. A triple expansion engine of 150 horse power is provided, and will be largely used by the students for experimental purposes. Two engines are also connected with the dynamos which generate the electricity for the 1,000 incandescent lights distributed among the various buildings. The ventilating apparatus is very complete, fresh air being furnished in such quantities that the air is changed every ten minutes and can be warmed by passing over steam coils if desired. Six boilers of 80 horse power each furnish heat to the various buildings and also power for actuating the ventilating fans. The boilers are connected with the various buildings by tunnels. On the first floor are offices, model rooms, etc., while in the annexed buildings are the machine shops, driven by electric motors, a foundry with an 18 inch cupola, a forge shop provided with a blower and smoke exhauster. In an adjoining building is the wood turning shop. The second floor of the main building (for the shops are only one story high) is devoted to recitation, lecture rooms, etc. From all appearances, the institution is now in a position to give a good course in engineering, and as for techical education, the plant will enable it to compete with the Pratt, Drexel and Armour Institutes.

AN IMPROVED RAILWAY BLOCK SIGNAL.

By means of the block signal system shown in the illustration, the engineer of a train entering a block may tell whether or not there is a train within the block, its location, if there be any, and the direction in which it is going. Fig. 1 is a plan view indicating two blocks of six miles each, provided with the improved apparatus, as shown in perspective in Fig. 2, and Fig. 3 represents the signal or indicator case, partly in edge elevation and partly in central section. The signal indicator cases are arranged in pairs, with their backs adjacent and a lamp between them, and the hollow supporting post communicates with a conduit, through which and the post are laid wires from contact brushes alongside the track to magnets in the indicator cases, there being one magnet behind each figure or indicator mark upon each dial. The contact brushes consist of metal plates having upwardly extending springs or points, and they are placed in position to be hit by a brush upon the locomotive, being placed a mile apart, as shown in the view, each mile being marked by a brush, and each side track being also provided with one of the brushes. The dial has seven marked spaces, 1, 2, 3, 4, 5, 6, and 0,-and one of the magnets is arranged directly behind each. The blocks may be of any length found most convenient.

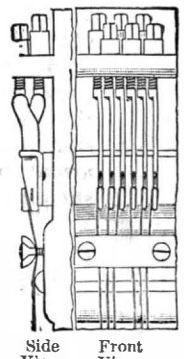


PETERS' RAILWAY BLOCK SIGNAL.

The indicators on one side of the track are used to indicate trains going in one direction and those on the other side indicate oppositely moving trains. A ground wire is connected to one pole of each of the magnets, and runs down through the hollow post to the ground, to complete the circuit through the magnets and energize them, whereby the indicator hand is drawn to the proper magnet and indicator mark. A wire runs from the contact brush at the side of the track, at the entrance to the block, to the magnet behind the "1" on the dial facing the direction from which the train enters; another wire runs from the same brush to the magnet behind the "1" of the indicator case facing in the opposite direction, at the other end of the block. At the end of the first mile of the block, connection is made from the contact brush to the magnet behind the "2" on the dials, and so on until the train passes out of the block, the brush at the exit being connected with the wire running to the magnet behind the "0" on the dials, while from the contact brush of the siding a wire is run to "S" on the dials, when the train passes a switch or siding. The contact brush on the locomotive is charged with an electric current from a battery or dynamo in any convenient position; but the invention provides for a modified arrangement, whereby the electric current may be supplied by a wire strung alongside of the track. Similar indicators may also be provided in the offices of train dispatchers, etc. Further information relative to this improvement may be obtained of the inventor, Mr. Robert D. Peters, No. 35 North Meridian Street, Anderson, Ind., or of Mr. Charles L. Wait, Winamac, Ind.

IMPROVED METHOD OF STRINGING PIANOS.

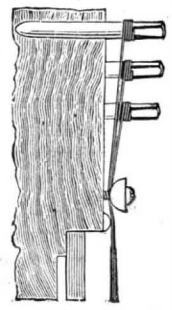
The improved method of stringing pianos, which has been used exclusively by the Mason & Hamlin Company for a number of years, is a great advance on the method formerly employed. The system is clearly shown in the accompanying cut. It discards entirely the old pin block. A rib is cast on the surface of the iron main frame, and the strings are fastened to lugs with screw ends, which go through the rib, a square-headed nut being screwed to each one. Turning the nut one way or the other, the string is tightened or loosened. All the strain comes directly on the iron plate, and the tension is due to screw resistance, and not to simple friction. The wires, starting directly from the lug, pass in almost a straight line to the agraffe and binder, so that the strain upon them is a straight one, and this does away with the bending back and forth which was the case when the old method was employed, and which was the principal cause of the breaking of the wires. In the new system, the entire frame being of metal and the strings being attached to it at both ends, instead of one end being secured to wood, as in the wrist pin system, there is a compensation, as in a watch. If the strings tend to lengthen by rise of temperature, the same change affects the frame, so as to keep up the tension upon the strings, whose correctness of pitch, therefore, is entirely independent of climate and hygrometric changes. In tuning by the ordinary system the key has to be turned back and forth until the proper pitch is reached. In the Mason & Hamlin system, the string is brought to the required pitch without any attempt at hitting the pitch by chance. The new system has three marked points of superiority to the old method. The pianos stay in tune much longer, are more durable, and the quality of tone is more refined and musically pure.



STRINGING—NEW METHOD.

The Mason & Hamlin pianos have attained a marked success since their introduction, and the constantly increasing number in use shows how thoroughly the many points of superiority are appreciated by lovers of music everywhere.

An illustrated catalogue describing the new method of stringing will be sent to any one on application at the main office of the company, 152 Tremont Street, Boston, or any of their branch offices or agencies.



STRINGING—OLD METHOD.

The Brooklyn Library.

The Brooklyn Library is celebrated for the excellence of its catalogue, the work of the late S. B. Noyes. This catalogue is noticed in the "Enclopædia Britannica." The library numbers 105,000 volumes. In the reference department we notice the "Scientific American Cyclopedia of Receipts" occupies a prominent place, and is in constant demand. "Experimental Science" is also constantly in use. The present librarian is Mr. W. A. Bardwell, and under his able management the library greatly flourishes.

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Correspondence.

Crystallization of Honey.

To the Editor of the Scientific American:

In your last issue you endeavor to answer a correspondent who does not want his honey to candy or crystallize. Now all honey will crystallize if kept cool, at least this is the rule (with seldom an exception), and this also is an excellent proof of the purity of the honey. This product is not injured in the least by crystallization, but if one objects to it, all he need do is to keep it air-tight and warm; but it should be allowed to remain, say two weeks, after being taken from the hive in an open vessel to allow it to ripen.

W. K. MORRISON.

Brooklyn, N. Y., March 24, 1893.

The Plans and Calculations for the Cruiser Bancroft.

To the Editor of the Scientific American:

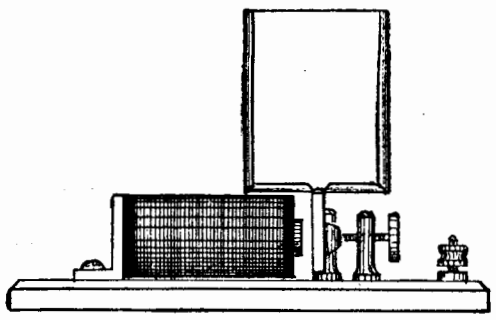
In a recent issue of your paper in which you give a very good account of the U. S. practice cruiser Bancroft, and her trial trip, you speak of her lines and model having contributed much to her remarkable speed, and say that they were made by the late Constructor Gatewood, of the U. S. navy. Allow me to correct you on this point. I have seen the original plan made by Constructor Gatewood, which is for a cruiser 10 feet 10 inches deep and of 800 tons displacement. I have also seen the plan from which the Bancroft was built, which is an entirely different model, and is 11 feet 6 inches deep, of 830 tons displacement. Mr. Charles R. Hanscom, now superintendent of the ship yard department of the Bath Iron Works, was in charge of the work, and Mr. A. B. Cassidy was the draughtsman. Mr. Hanscom made all the plans and calculations of displacement, stability, shearing stresses, etc., and wrote the specifications for this ship, which were approved by Chief Constructor Wilson and adopted by Secretary Tracy. By giving such publicity as you think advisable to this statement, you will put the credit for the design of the Bancroft where it belongs.

THOS. W. HYDE.

Bath, Me., March 25, 1893.

To the Editor of the Scientific American:

In repeating the experiments on the "Persistence of Vision," described by Dr. T. O'Conor Sloane in the SCIENTIFIC AMERICAN of January 21, it occurred to me



to use an electrical vibrator for producing the results instead of the tuning fork which was described. This method has the advantage of allowing a better study of the figures, because of constant vibration. The card holder can be attached to the mechanism of an ordinary electric bell, or a vibrator can be constructed for the purpose. In this case a greater amplitude of vibration can be obtained. The spring supporting the armature should be very weak, and the current used should be just strong enough to move the armature. By this method an amplitude of vibration of three-eighths of an inch or more can be obtained.

By drawing the designs on the tracing cloth used by architects and engineers the results can be projected on a screen with a lantern, and thus be made visible to a large audience.

RICHARD H. RICH.

Beverly, Mass., January 30, 1893.

Swedged Screws.

To the Editor of the Scientific American:

The chance perusal of an issue of your paper containing an account of the process of cold-forging wood screws, as practiced by the American Screw Company, calls to mind an interesting and perhaps not well known chapter in the history of the art.

For many years prior to 1890 resided in Utica, N. Y., a gentleman of the name of Harvey J. Harwood. In early life, Mr. Harwood was a working machinist, a vocation he left later on, to take up the business of photography. This business he followed for many years. Being of an inventive turn of mind and retaining his taste and love for mechanical matters, he experimented for some years, and eventually invented and constructed a machine for cold-forging or swedging wood screws. During his declining years Mr. Harwood was fond of visiting the shop in Utica in which the writer was at that time employed; and gaining his acquaintance, and, to a certain extent, his confidence, I was several times invited to inspect his machine, a privilege of which I gladly availed myself. While the machine was somewhat crude in design and much too light for its work, it made screws, samples of which I still have.

About 1888 a gentleman, said to be a representative of the American Screw Company, visited Utica, and in company with an acquaintance of mine called on Mr. Harwood, who was then an old man, enfeebled in mind and body.

The next day the Harwood machine was brought to the shop, carefully boxed and shipped to the American Screw Company. The published details of the American Screw Company's machine show great similarity to those of Harwood's, the forming dies being apparently identical with those of Harwood. Mr. Harwood was a man of singular truthfulness and transparency of character, and he always claimed and believed himself to be the first inventor of the cold process of screw making. While it is not the purpose of this communication to excite controversy, or in any sense detract from due merit, it seems only a just compensation for years of unproductive toil that the dead inventor's name should be associated with a process that formed a large part of his life work.

This is an honor that, to my knowledge, has never, even in a humble way, been accorded him. S.

Decisions Relating to Patents.

NOVELTY.

In letters patent No. 253,572, issued February 14, 1882, to John E. Atwood, for an improved support for spindles in spinning machines, the characteristic feature of the invention is "a supporting tube which is flexibly mounted with relation to the spindle rail, and contains the step and bolster bearings for the spindle, so that the latter and said tube may move together laterally in all directions during the self-adjustment of the spindle, while carrying an unequally balanced bobbin and its yarn, instead of relying upon the movement of the spindle and its bearing within and independently of the supporting tube, as heretofore." It is held by the Circuit Court that this invention possessed patentable novelty over the spindle support of Francis J. Rabbeth, covered by letters patent No. 227,129, issued in 1880, and over the unpatented Danforth spindle of 1842. 1.

COMBINATION.

Letters patent No. 178,750, issued June 13, 1876, to Henry Ennis, for an improvement in telegraphic fire alarms, cover a device consisting of a hammer arm for operating a bell, a pencil recording a message on a traveling strip of paper, and a pencil for recording the time of day on the face of a rotating clock dial, all connected by arms and pivots to the armature of an electro-magnet, so as to be simultaneously operated by an electric current. Claim 1 is for a telegraphic receiving instrument adapted to register a message and record the time of its reception, substantially as and for the purpose set forth. The Circuit Court decides that, while each of the two elements covered by the claim are old, the combination is not a mere aggregation, but, on the contrary, achieves a new and useful result by co-operating action. 2.

ANTICIPATION.

The Circuit Court rules that claim 1 of letters patent No. 301,884, issued July 15, 1884, to Theodore E. King and Joseph Hammond, Jr., for an overshoe clasp, consisting in the combination of a catch plate, a tongue pivoted directly to the tongue plate, and the tongue plate extending rearward of the pivot, and in contact with the catch plate, when the parts are engaged, was not anticipated by either the Hartzhorn patent of 1849, No. 6,736, or the Budd patent of 1871, No. 120,323. 3.

The Circuit Court holds that letters patent No. 178,750, issued June 13, 1876, to Henry Ennis, for an improvement in telegraphic fire alarms, consisting of a hammer arm for operating a bell, a pencil for recording a message on a traveling strip of paper, and a pencil for recording the time of day on the face of a rotating clock dial, all connected to the armature of an electro-magnet so as to be simultaneously operated, were not anticipated by the old watchman's clocks, which make a mark on a time strip when a button is pressed, or by the British patent of October 12, 1872, to Whitehouse & Philips, for a recording apparatus for public vehicles. 4.

Letters patent No. 296,377, issued April 8, 1884, to John E. and Eugene Atwood, for an improvement in the means of driving spindles by bands, so as to permit the use of narrow spindle frames, consist of the combination of a drive pulley and a guide pulley having parallel axes, and arranged one above the other, two spindles on opposite sides of said pulleys, and two driving bands, each encircling both pulleys and the whirl of the spindle, and each consisting of three parts, two of which pass horizontally between the whirl and the adjacent sides of the pulley, and the third passing directly from one pulley to the other between the horizontal portions. It is held by the Circuit Court that the patent was not anticipated by a machine alleged to have been constructed and used continuously from 1877 by the W. G. & A. R. Morrison Company in its factory at Willimantic, Conn. 5.

Letters patent No. 225,261, issued March 9, 1880, to Orator F. Woodward, are for a "new and useful improvement in compositions of matter for making moulded articles of manufacture," such as flower pots, vases, cuspidors, etc. Flying targets or "birds," though not specified by the patentee, were made in large numbers under the patent. The composition consisted of gypsum and resin mixed under heat. The Circuit Court decides that the patent was not anticipated by certain previous compounds from which flying targets had never been made, and from which the patentees never contemplated that they would be made. 6.

The Circuit Court lays it down that letters patent Nos. 359,687 and 359,688, both issued March 22, 1887, to Bernice J. Noyes, for an invention relating to a system of municipal signals, whereby, automatically, and independently of the operator's will, the reception of emergency signals is always marked by the ringing of a bell, while the reception of patrol signals on the same register is never accompanied by an alarm, were not anticipated by either the patent of July 26, 1881, to J. W. Stover, for "improvements in telegraphic relays," the Field patent of June 19, 1883, for an apparatus for recording stock quotations, or the Wilson patents of March 3, 1885, and June 9, 1886, relating to a municipal telegraph apparatus. 7.

WHAT CONSTITUTES INFRINGEMENT.

In letters patent No. 253,572, issued February 14, 1882, to John E. Atwood, for an improved support for spindles in spinning machines, the characteristic feature of the invention is "a supporting tube which is flexibly mounted with relation to the spindle rail, and contains the step and bolster bearings for the spindle, so that the latter and said tube may move together laterally in all directions during the self-adjustment of the spindle, while carrying an unequally balanced bobbin and its yarn, instead of relying upon the movement of the spindle and its bearing within and independently of the supporting tube, as heretofore." It is held by the Circuit Court that the 2d, 3d, and 5th claims of the Atwood patent are infringed by a device substantially similar in form, except that the bottom of the supporting tube is surrounded by a closed oil cup, which prevents the facility and promptness with which the flexibility of the spindle can be graduated; for a copyist cannot escape infringement by adding features which hinder the patented combination from exhibiting some of its minor advantages. 8.

Letters patent No. 178,750, issued June 13, 1876, to Henry Ennis, for an improvement in telegraphic fire alarms, cover a device consisting of a hammer arm for operating a bell, a pencil for recording a message on a traveling strip of paper, and a pencil for recording the time of day on the face of a rotating clock dial, all connected by arms and pivots to the armature of an electro-magnet, so as to be simultaneously operated by an electric current. In ruling the Circuit Court says that the claim is infringed by an apparatus having a magnet in the main circuit, whose armature controls the receiving device and time stamp as in the patent, notwithstanding that the motion is communicated by means of relays or sub-circuits instead of by levers; for, both means being well known, the one is merely the equivalent of the other. 9.

The Circuit Court decides that claim 1 of letters patent No. 301,884, issued July 15, 1884, to Theodore E. King and Joseph Hammond, Jr., for an overshoe clasp, consisting in the combination of a catch plate, a tongue pivoted directly to the tongue plate, and the tongue plate extending rearward of the pivot, and in contact with the catch plate, when the parts are engaged, is infringed by a buckle made under letters patent No. 418,924, issued January 7, 1890, to John Nase, which shows a rearward extension of the upper plate, although it differs from the King and Hammond buckle in certain other respects. 10.

1. Sawyer Spindle Co. *v.* W. G. & A. R. Morrison Co., 52 Federal Reporter, 590.
2. Municipal Signal Co. *v.* Gamewell Fire Alarm Tel. Co., 52 Federal Reporter, 459.
3. Hammond Buckle Co. *v.* Goodyear Rubber Co., 52 Federal Reporter, 587.
4. Municipal Signal Co. *v.* Gamewell Fire Alarm T. Co., 52 Federal Reporter, 459.
5. Atwood *v.* W. G. & A. R. Morrison Co., 52 Federal Reporter, 475.
6. Cleveland Target Co. *v.* United States Pigeon Co., 52 Federal Reporter, 385.
7. Municipal Signal Co. *v.* Gamewell Fire Alarm T. Co., 52 Federal Reporter, 464.
8. Sawyer Spindle Co. *v.* W. G. & A. R. Morrison Co., 52 Federal Reporter, 590.
9. Municipal Signal Co. *v.* Gamewell Fire Alarm T. Co., 52 Federal Reporter, 459.
10. Hammond Buckle Co. *v.* Goodyear Rubber Co., 52 Federal Reporter, 587.

POLICE statistics show that the arrests for drunkenness in London are at the annual rate of one to every 175 inhabitants; in Birmingham, one to 153; in Manchester, one to 71; and in Liverpool, one to 50.

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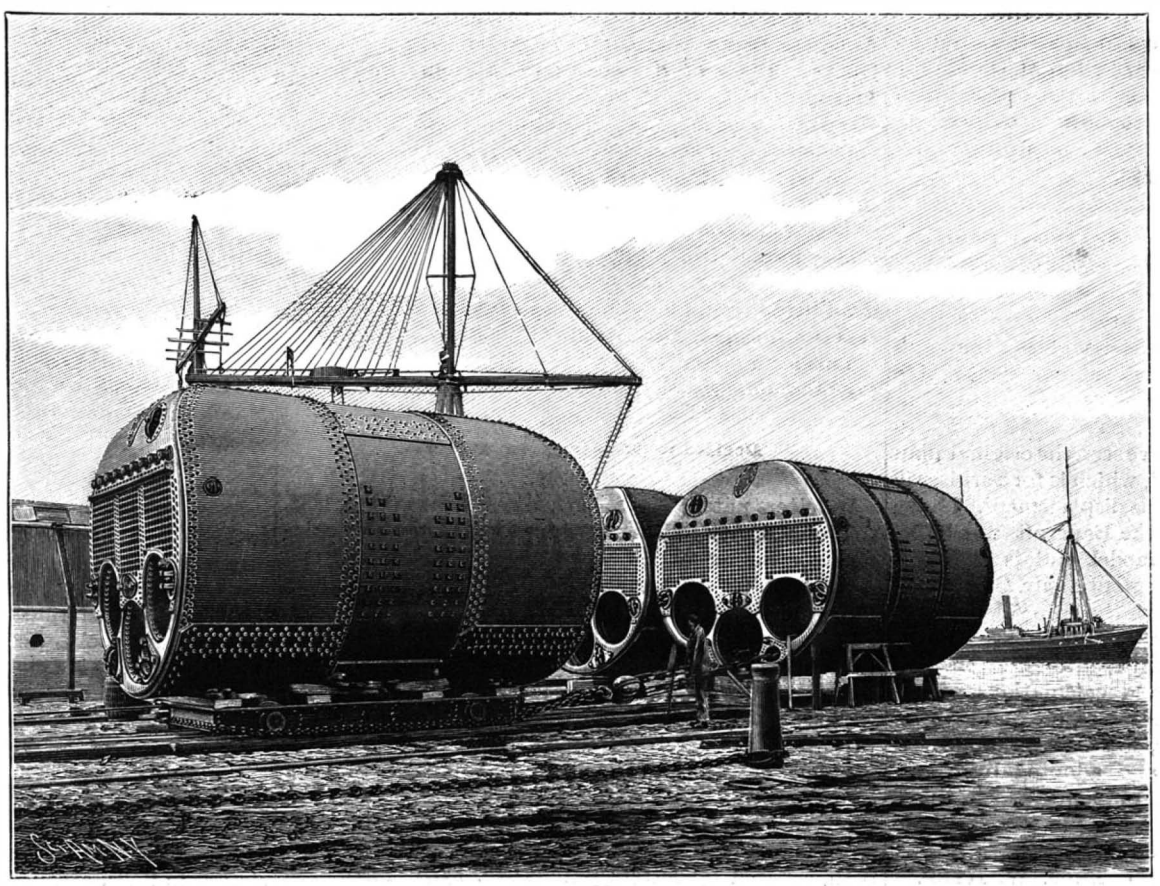
BOILERS FOR THE NEW CRUISER CINCINNATI.

The new cruiser Cincinnati is now lying at the Brooklyn navy yard docks, receiving her machinery, which is the production in its entirety by the machine and boiler shops of the Brooklyn yard. The keel of the Cincinnati was laid in January, 1890. Built of steel. Length, 300 feet; beam, 42 feet; depth, 23¾ feet. Displacement, 3,183 tons. To have a main battery of ten 5 inch rifles, one 6 inch rifle. Secondary battery, eight 6 pounders, four 1 pounders, 2 Gatling guns, and a ram. Twin screws of bronze sectionalized and movable for variable pitch. Triple expansion engines in separate compartments, aggregating 10,000 horse power, designed to give the ship a speed of 19 knots per hour. The boilers, three of which we illustrate as they lay upon the dock ready to be swung aboard by the great navy yard derrick, are representative of the best quality of material and workmanship that can be produced. They were designed by the engineering department of the navy and constructed of the toughest American steel under the supervision of Chief Engineer James H. Chasmer, U. S. N. They have been tested at 250 pounds hydrostatic pressure and are to carry 160 pounds pressure. The boiler plant consists of four main double end boilers of 14 feet 4 inches and 13 feet 4 inches diameter respectively by 20 feet 3½ inches in length, with six corrugated furnaces in each boiler, 3 feet 6 inches diameter. Boiler shells of 1 15-64 inch steel plate.

Two auxiliary boilers 11 feet 4 inches diameter, 9 feet 10¼ inches long, single end with two corrugated furnaces each; boiler shells 1 inch steel plate. The aggregate grate surface of the boiler plant is 518 square feet, heating surface 18,179 square feet, number of tubes 3,992, 7 feet 4 inches long by 2¼ inches diameter; ratio of grate surface to calorimeter 7 to 1. Ratio of grate surface to heating surface 1 to 33. Pounds of coal burned per square foot of grate surface, 40 under full pressure and speed.

The corrugated furnace shells were welded and rolled at the Continental Iron Works, Greenpoint.

We are indebted to Chief Draughtsman L. E. Bartlett, of the machine department of the Brooklyn navy yard, for details.

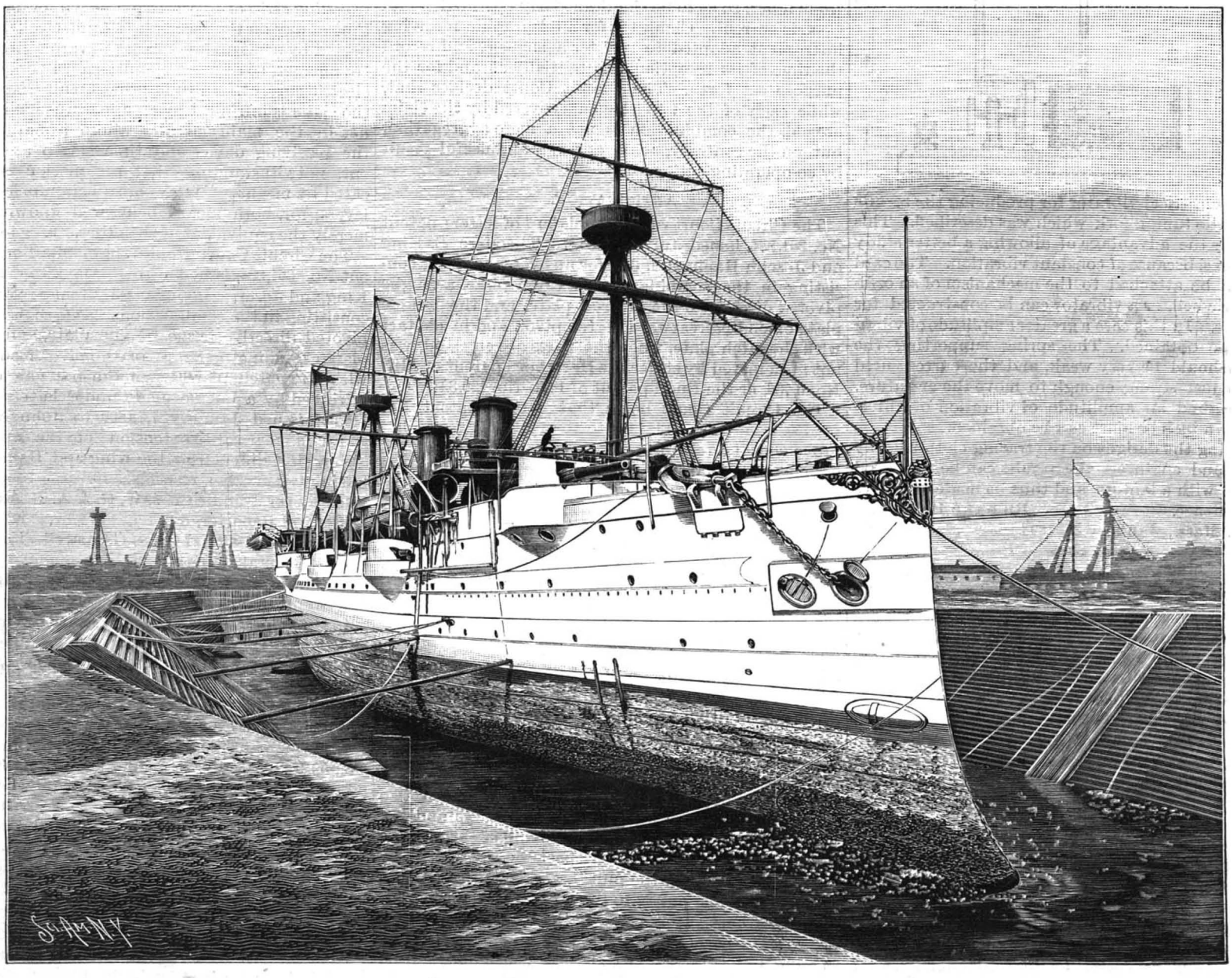


BOILERS FOR THE U. S. CRUISER CINCINNATI.

THE CRUISER BALTIMORE IN DRY DOCK.

It is about two and a half years since the cruiser Baltimore sailed out of New York harbor on the voyage to Sweden, with Captain Ericsson's body on board. Since that time she has done 48,000 miles of cruising, visiting various European ports, remaining considerable time in the Mediterranean, and finally getting around to the Pacific, where she appeared in time to represent the United States at some of the Chilean ports during the temporary misunderstanding our government had with that power. She has come home now to take part in the great Columbian naval parade and review, but as a preliminary thereto it was highly essential that she should have her bottom cleaned and painted, for which purpose she was placed in the dry dock at the Brooklyn navy yard. Our engraving is from a photograph, and therefore faithfully represents, without any exaggeration, how completely the entire bottom of the vessel below the water line is covered by barnacles, accumulated during her long cruise. Such an abundant deposit of these crustaceans as had fastened themselves on the hull of the vessel had the effect of materially lowering the speed of the vessel, as always happens in such cases, and for this reason officers of the navy claim that a vessel cruising in southern waters should have her bottom cleaned as often as twice a year. The Baltimore was some twenty days in the dry dock, but after the naval review she will probably receive more extensive repairs.

The Baltimore was completed in 1889, and developed on her trial trip over twenty knots an hour. She has two horizontal direct-acting triple-expansion engines, with two high pressure cylinders, each 43 inches diameter, two intermediates 60 inches diameter, and two low pressure 94 inches, the piston stroke being 42 inches. She is 335 feet



THE U S. CRUISER BALTIMORE IN DRY DOCK, TO REMOVE BARNACLES FROM HER BOTTOM

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length over all, 48 feet 6 inches moulded breadth, 19 feet 6 inches draught, and has a displacement of 4,400 tons. Her armament consists of four 8-inch breech-loading rifled guns, six 6-inch breech-loaders, eight 6-pounder rapid-firing guns, and she has two steel masts with tops, in which Gatling guns are mounted. She is also fitted with five torpedo tubes.

A Yucatan Exhibit at the Fair.

One of the most interesting displays that will be seen at the Fair will be that made within the "Ruined Palace of Mitla" by the Department of Ethnology. Prof. Edward H. Thompson, who has been consul at Merida for eight years, has prepared papier-mache moulds of the ancient sculptures found in the deserted cities of Yucatan, and thirty cases of these moulds have already arrived at the Park. They will be installed as soon as the building is completed. The ruins of Uxmal will be reproduced on an extensive scale, and among them will be a perfect fac-simile of the temple and figure of the god "Kukulkan," or the great feathered serpent. The body of the serpent is wrought in the stonework all around the building, and this will be represented entire. The original materials were principally marble and coarser varieties of limestone, and the work shows that the ancient Yucatecos possessed great skill in mechanical workmanship, though their industrial arts were but poorly developed. One of the finest reproductions by Professor Thompson will be that of an arched gate of the ancient palace of Labra, which was literally chopped out of the jungle. —*Chicago Inter-Ocean.*

Borings in Broadway, New York.

Mr. William Barclay Parsons, M. Am. Soc. C. E., read a paper recently before the society on this subject. We make the following abstract from the *Transactions:* In order to ascertain the quality and nature of the material underlying Broadway, in the city of New York, the Rapid Transit Commission of this city undertook a system of borings in 1891 under the direction of Chief Engineer William E. Worthen, past president of this society, and under the immediate supervision of the writer as principal assistant engineer.

In general, the system followed was to put down a test hole at every street crossing from South Ferry along Whitehall Street to Broadway, and thence to Thirty-fourth Street, a distance of about three and one-half miles. These holes were sunk by the water-jet process and were carried down until rock was encountered. The method of proceeding was to select a spot where, as far as the inspector in charge could tell, the line of the hole would not encounter any pipe, subway, sewer or any other subsurface structure. One paving block would then be removed and a test would be made with a sounding rod for eight or nine feet, to determine whether the location was free from obstructions. If so, a two-inch pipe would be driven to serve as a casing. In order to drive this pipe a small portable pile-driver was used, the top of the pipe being covered with a protecting cap. The hammer, weighing 150 lb., was directed between four light metal guides and had a fall of about six feet, the whole arrangement being supported on a cast-iron stand. The hammer was raised by hand power.

After two or three lengths of casing had been driven, the protecting cap was removed and a tee screwed on in place, and down the pipe was inserted a three-quarter inch wash pipe with a chisel point, in the corners of which were two small holes. Water was then forced into this wash pipe, while two men worked the pipe down by hand. The water thus discharged, washing the sand away from the foot of the wash pipe, flowed upward between the wash pipe and casing, carrying the sand with it. This water and sand flowed out of the side opening of the tee at the top, and was caught in a bucket and sampled by the inspector in charge. Some of the results obtained were quite different from what had been expected; first, rock was at a much greater depth than had been believed, being over 163 feet down at Duane Street; secondly, the rock at Canal Street is not the deepest along the line; thirdly, the material underlying the surface at Canal Street is not muck and fine sand, but, on the contrary, consists largely of good coarse gravel, and presents an excellent material for foundations.

FOUNTAIN OF SAINT GEORGE AND THE DRAGON, VIENNA, BY ANTON DOMINIK RITTER VON FERNKORN.

Vienna has no abundance of public monuments, and it is therefore a pity that one of its choicest works of sculpture should be hidden in the courtyard of a palace where connoisseurs are the first to search for it. In fact, a great many Viennese have never seen the original group, Saint George and the Dragon, which ornaments the fountain at the palace of Prince Montenuovo, situated in Strauchstreet, Vienna. It has, however, become quite popular, as so many excellent copies of it have been made.

FOUNTAIN OF SAINT GEORGE AND THE DRAGON VIENNA, BY ANTON DOMINIK RITTER VON FERNKORN.

We present to our readers a successful print of this animated group from a photograph of the original, which reminds one of the great master, Anton Ritter von Fernkorn, who has ornamented Vienna with so many creations of his powerful genius. This group was his first great work, and his other monuments are the best in Vienna.

We are indebted to *Wiener Bauindustrie Zeitung* for our illustration, and also the foregoing remarks.

Australia Grows the Largest Trees in the World.

A recent article in *Science* repeats the old idea, which has been frequently refuted, that the *Sequoia gigantea*, or Big Tree of California, is the largest tree known. It has been shown many times that these trees are surpassed in both height and girth by the gum trees of Australasia. A large number of species are known, and many of them are mentioned in Baron Von Mueller's "Extra Tropical Plants," recently reviewed in these columns. An extract from this book will be of interest, as giving the dimensions of some of these immense trees. Of *Eucalyptus amygdalina* it is said:

"In sheltered, springy, forest glens attaining exceptionally to a height of over 400 feet, there forming a smooth stem and broad leaves, producing also seedlings of a foliage different from the ordinary form of *E. amygdalina*, which occurs in more open country, and has small narrow leaves and a rough brownish bark. The former species or variety, which has been called *Eucalyptus regnans*, represents probably the loftiest tree on the globe. Mr. J. Rollo, of Yarragon, measured a tree which was 410 feet high. Another tree in the Cape Otway ranges was found to be 415 feet high and 15 feet in diameter where cut in felling, at a considerable height above the ground. Another tree measured 69 feet in circumference at the base of the stem; at 12 feet from the ground it had a diameter of 14 feet; at 78 feet a diameter of 9 feet; at 144 feet a diameter of 8 feet, and at 210 feet a diameter of 5 feet. [Thus, at a height in the air exceeding the height of almost every North American forest tree, this specimen had a diameter equal to most of our largest forest trees at the ground.] Other trees are known with a stem circumference of 66 feet at 5 feet from the ground. Prof. Wilson and Colonel Ellery obtained at Mount Sabine a measurement of 21 feet 8 inches in diameter of a stem, where cut, the length being 380 feet. Colonel Ellery had repeatedly reports of trees seven ax handles in diameter, and he met a tree on Mount Disappointment with a stem diameter of 33 feet at about 4 feet from the ground." Other species also attain enormous size. *Eucalyptus diversicolor* is known to grow 400 feet high, and trees have been measured 300 feet long without a branch! Boards 12 feet wide can frequently be obtained. *E. globulus* grows 300 feet high and furnishes ship keels 120 feet long. *E. obliqua* also attains 300 feet in height and 10 feet in diameter. A note in a recent number of *Garden and Forest* mentions a tree in Victoria 471 feet in height.

The colossal size of the trees of this genus is not the only peculiar feature they possess. Some are of exceedingly rapid growth, and are at the same time very durable. *Eucalyptus amygdalina*, for example, grew to a height of 50 feet in 8 years in the south of France. *E. citriodora* grew 20 feet high in 2 years in a district subject to protracted drought; and a trunk 40 feet long and 20 inches in diameter only broke after a flexion of 17 inches, under a pressure of 49 tons. *E. corymbosa* is very durable, fence posts that had been in the ground for 40 years showing hardly any decay. *E. globulus* grew 60 feet high in 11 years in California, and in Florida 40 feet in 4 years, with a stem a foot in diameter. The writer has seen trees in California, two years after planting the seed, 20 feet high; and the wood, although easily cut when green, becomes almost as hard as iron when dry. In Guatemala it grew 120 feet in 12 years and had a stem diameter of 9 feet. Railway sleepers made of *E. leucoxylon* were quite sound after being laid 24 years. Piles driven for a whaling jetty in 1834 were taken out in 1877 perfectly sound, although the water swarmed with teredo. This was *E. marginata.* Still more remarkable is the fact that some species withstand excessive heat and also a considerable cold. *E. microtheca*, for example, resists a temperature of 18° F. in France and 154° F. in central Australia. Besides serving as a timber tree, many species of *Eucalyptus* are used medicinally, producing a volatile oil very useful in treating various infectious diseases, like scarlet fever, especially when applied externally. Grown in malarious districts, they possess the power of purifying the air. Altogether, the genus may be classed as one of the most remarkable in the whole world.—*Joseph F. James, M.Sc., in Science.*

ALUMINUM is found combined with 195 other minerals, and, therefore, constitutes a large part of the crust of the earth, but until recently has been very expensive because of the difficulty of separating.

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BIRDS WHICH NEST IN CAVITIES AND BURROWS.

BY MORRIS GIBBS.

Of the birds of Michigan which nest in excavations in wood or earth, there are probably nearly fifty species. In this division of nesters I have met with twenty-eight species nearly all of which habitually occupy a cavity during the duties of nesting.

The woodpeckers are pre-eminent as excavators in solid wood, and undoubtedly all of the nine species found in Michigan follow this custom, and with the aid of friends I have recorded seven kinds of these carpenters which bore or peck out their homes.

Then there are the nuthatches, which are capable of digging in soft decayed wood, but who quite as often select a site formerly occupied by a stronger-billed bird. The white-breasted nuthatch, which is the commoner of the two and much more social in its relations with man, often chooses an artificial cavity in the cornice of a building. The opening may be small, while the interior is very capacious, and to fill this large space and have snug quarters, the industrious birds often carry in nearly a peck of rubbish. The house wren also not infrequently fills cavities with twigs, grass and other litter, and then, strange to say, often leaves the premises for other quarters. The oddities of this little snuff-colored bird in the arrangement of its household affairs are very amusing and will furnish entertainment for any student. Why it is that all wrens with which I am acquainted seem desirous of amassing real estate in the shape of a collection of nests is more than I can conjecture, but it is a habit with which all are possessed. I have known a pair of house wrens to engage in the act of building in four different situations at one time. The winter wren, that ecstatic singer of the deep wild wood, rears its young in the hollow of some old log or stump.

Our vivacious acquaintance, the black-capped chickadee, digs out a shallow burrow in the decayed side of an old stump in early May. Not rarely, after working for a day or more, the pair encounter a layer of hard wood in the old weather-worn stump, and have to cease their efforts and look for a more suitable spot, for the little conical beak of this titmouse has not sufficient strength to penetrate hard substances. When the cavity is complete the bottom is lined with soft materials, nearly always dry moss and the hair of some of our small mammals, generally rabbit fur. On this delicate bed seven or eight white eggs, dotted with pink, are laid. I do not know of a more tempting discovery than the finding of one of these little nests. The circular entrance, which is generally from two to three feet from the ground, is not much more than one inch and a quarter in diameter. The excavation is usually about six inches deep and is widened out to accommodate the prospective family. Nearly one-half of the space is filled with the fluffy material of the nest. The chickadee occasionally adopts other quarters than those excavated by itself, and has been known to come into the city and build in an outhouse, after the manner of the more social wren. This is one more instance of the adaptation of birds' ways to a half civilized standard; or we may say that it is in conformity to the certain changes of evolution; demanded, as we can plainly understand, as in the case with the swallows and swifts.

Our common bluebird is another well-known example of the inhabiters of cavities. It never digs out these retreats, and seems to accept almost any kind of quarters, either in a clearing or in a bird house in the village.

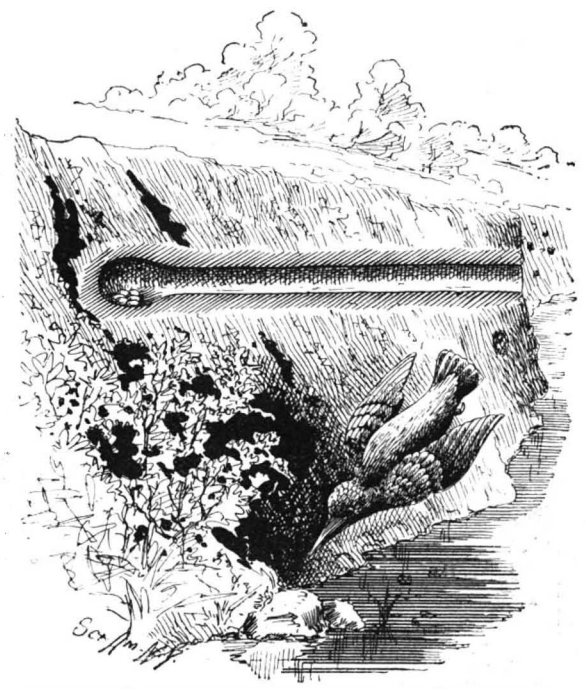
One species of swallow builds regularly in cavities, of course accepting those provided for it, generally preferring those holes in dead trees about water, over which it largely secures its food, but occasionally taking possession of a bird house. It is a graceful, pleasing bird, with a glossy blue back and white under parts, and is known to the boys as the tree swallow.

Among the warblers there is but one species that nests in holes. This is the prothonotary or lawyer warbler, and is commonly called the golden swamp warbler. It builds its nest almost invariably at the edge of water or over it. It is a handsome, lively bird, and its nest of moss usually contains five or six eggs. The great crested flycatcher is the only one of the family in Michigan which selects an excavation for its nest. The situation chosen varies greatly; hollow limbs, telegraph poles, fence rails and holes in stubs are the usual selections. The five or six eggs are laid in a nest composed of rubbish, and in which there is nearly always found a cast-off snake skin. Sometimes there are two of these skins, and I have found portions of three. This is the only species of bird which presents this peculiarity in Michigan, and naturalists have tried vainly to account for the habit.

Among the birds of prey there are several known which lay their eggs in holes. The common sparrow hawk lays its five or six blotched eggs in a cavity in a tall dead stub, while the screech and barred owls select somewhat similar situations. The great horned owl often builds its nest in a huge cavity in the trunk of a large forest tree, but the nest is about as often built in exposed situations in the crotches of the tree, after the manner of the hawks.

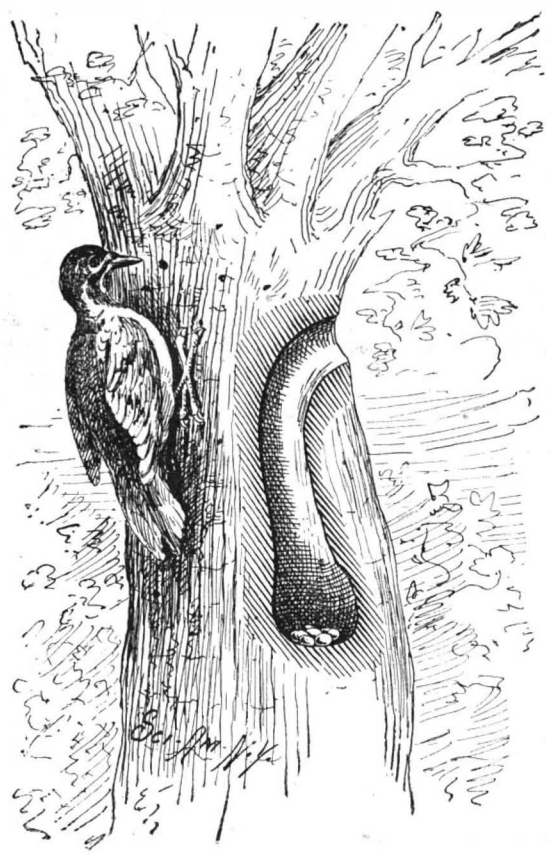
I have only met with one duck's nest, that of the mallard, placed otherwise than on the ground. This set of eleven eggs was laid in a deep cavity at the top of a large stub which stood in the water. The wood duck always builds its nest in the cavities of trees near the water.

Two kinds of swallows burrow in banks in the nesting season. The common bank swallow or sand martin is very abundant in sections, and I have seen as many as two hundred burrows in one bank on the



BANK WITH KINGFISHER'S NEST.

Kalamazoo River. These holes are generally about the length of one's arm, rarely longer, and at the end of a nearly straight burrow the flimsy nest of dead grass is found holding the five, six, or seven crystal-white eggs. As a rule the burrow has to be dug away in order to reach the nest, as the entrance is not of a size to admit the hand and arm. Another species, more often found breeding by isolated pairs, and much rarer, is a near relative, the rough-winged swallow, whose burrows are deeper and are further distinguished by having a round entrance hole, whereas the opening of the common bank swallow's burrow is elliptical in shape. The belted kingfisher is another burrower, and sometimes digs his tunnels over six feet in length. Generally they are between four and five feet deep, and wind about slightly. At the end of this tunnel is an enlargement sufficient to accommodate six to eight glo-



SECTION OF TRUNK SHOWING NEST OF A WOODPECKER.

bular white eggs and the sitting bird. The eggs are deposited on the bare, cold sand, usually in early May.

Occasionally we observe oddities in the selection of a nesting site, as in the rare case of a robin building in a cavity in a stump. It is not unusual for bronzed grackles to nest in hollows in stubs, in newly cleared quarters, showing that a species that generally builds nests on limbs of trees can take advantage of opportunities for protection when afforded.

The eaves and barn swallows and purple martins and also the swifts accept the protection afforded by man by nesting under the eaves and within barns and sheds, and bird houses, cornices, and chimneys.

All owls, woodpeckers and the burrowing swallows and kingfishers lay white eggs, but the rule is not unvaried regarding white eggs with those species which breed in excavations, for the sparrow hawk, nuthatches, house wren, and brown creeper all lay well spotted eggs.

Hunting the Polecat.

BY THOMAS HOLMES.

From the 15th of November till the 1st of March a good many of the dwellers in the rural districts of Connecticut, and especially in the Connecticut River Valley, find profitable employment in trapping polecats.

The occupation is not a pleasant one for a person whose sense of smell is toned up to the point of fastidiousness, but it pays far better than farming or any other vocation that offers itself to the back-country dweller.

The trapper, about the middle of November, sets stone traps and baits them with pieces of fresh meat. A chicken's wing, the "hind quarter" of a musk rat, or a piece of fresh rabbit is considered a fetching bait. The trap is a heavy flat stone, supported by notched sticks that are held in place by a spindle, upon the end of which the bait is placed. In attempting to take the meat from the spindle the trap is tripped and the stone falls on the animal,

The most favorable localities for setting these traps are under the walls around pasture lots and near ledges and old cellars or chimney stacks. Steel traps are sometimes used. They are placed in burrows; but it is necessary to carefully conceal them, or the animal will dig around the trap and escape.

When deep snow covers the ground, the skunk remains in its burrow and the trappers are obliged to wait until the ground is bare again before hunting the animal.

When the polecat is stirring, his favorite stamping ground is easily found, for the soil will be turned up as if by pigs. The animal roots in the ground for worms and roots of grass and certain shrubs. He is also fond of eggs and chickens, and he makes bad work for the farmer when he manages to get into his chicken house. He seems to hold the flesh of the fowl in a lower estimation than its blood. When a skunk finds himself in a well filled chicken house he proceeds to kill the fowls, and as he does so he drinks their blood, sometimes so gorging himself as to be unable to get away, and he falls into the hands of the person whose property he has destroyed.

In the fall skunk hunting is quite a popular sport among the men and boys of the back-country. The hunt usually takes place on the "young o' the moon." The participants clothe themselves in raiment for which they care but little, and, armed with a stout club or pole, from eight to twelve feet long, they take to the field about nine o'clock in the evening.

The polecat has an uncanny preference for cemeteries, and, if moving at all, he will be found burrowing around a graveyard oftener than anywhere else. If there is a cemetery within a reasonable distance, the hunter makes it his objective point.

When the game is sighted, the hunter, moving as stealthily as possible, advances upon it, and if he manages to get within striking distance of it without having been noticed, he stamps on the ground. The animal, on hearing the sound, immediately faces the enemy. There is a quick blow of the club, carefully aimed, and the polecat's days are ended. It sometimes happens that the aim of the hunter is faulty and the animal is not seriously hurt. Then it is that the man takes to his heels and beats an inglorious retreat.

From the fatty substance taken from the animal the country people try an oil, which they believe possesses wonderful medicinal properties, and it is freely used by them in severe cases of croup, inflammation of the lungs, and rheumatic affections.

The true value of the animal lies in its pelt, which finds a ready market. The pelts are graded in three classifications, viz.: Stripe, half stripe, and black. In the majority of skunk pelts there is a white stripe running from the head to the tail. These are classed as striped skins. When the white stripe extends only half way along the back it is a "half stripe" skin. A black pelt has but very little white in it, and it brings a much higher price than either of the other classifications.

Within the past few years skunk skins have made a wonderful increase in value. Formerly the hides went slowly at ten cents apiece; but the demand has grown for them, and a stripe and half stripe pelt now brings the trapper from eighty cents to one dollar and a black skin goes at one dollar and a half.

The skins are used extensively in the manufacture of fur garments. The monkey skin capes and muffs that were so popular a year ago were largely made of black skunk skins. Large numbers of them are annually exported to Europe, where they are manufactured into caps and other articles of wearing apparel.

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RECENTLY PATENTED INVENTIONS.

Engineering.

PROPELLER SHAFT THRUST BEARING.—Hans C. Pedersen, Brooklyn, N. Y. A sleeve having frictional engagement with the shaft is held to revolve in the outer end of the thrust block, a collar rotating on the exterior of the block having recesses in its inner face in which are fitted adjustable blocks, while friction rollers engage the outer end of the thrust block and the collar of the shaft, balls being interposed between the outer ends of the rollers and the inner surfaces of the adjustable blocks. By this improvement, which is readily adaptable to any propeller shaft, it is designed that the friction between the shaft and the bearing will be greatly reduced, while the construction is economical and durable, and quick and convenient access is afforded to any of its parts.

GAS GENERATOR.—John H. Miller, Jr., Galion, Ohio. This is a water gas generator for the manufacture of gas for either heating or lighting purposes by the decomposition of steam and oil. Above the fuel chamber is a vertical partition wall in the middle forming two compartments, with baffle plates arranged in them, and with oil inlets, draught dampers, and gas outlets arranged at the top of the compartments. The improved generator is easily and economically operated, and very effective in producing a large volume and good quality of fixed gas, without being fouled by deposits of carbon. The baffle plates are tiles which are easily put in and taken out, and afford a great heating surface for fixing the gas without the use of checker work.

Railway Appliances.

METALLIC TIE.—Albert E. Roberts, Norwalk, Ohio. The base or tie bar of this tie is formed of a steel plate with upwardly bent side flanges, in conjunction with which is used a metal seat block, having spiked sockets at its opposite ends ending at their lower ends in angular enlargements, into which angular detachable abutments are projected. This tie is designed to absolutely prevent the spreading of rails, is not expensive to manufacture, and can be quickly placed in position, the spikes as they are driven having their ends automatically clamped to the seat block to prevent drawing.

CAR STARTER.—Karl J. Pihl and Oscar W. Hult, Brooklyn, N. Y. On one of the car axles are two fixed clutch hubs and two loose clutch disks, a loose spiral spring on the axle being fast to the clutch disks, with means of locking and unlocking either clutch disk. The device is very simple, and is adapted to store energy when the car is stopped, giving out such energy again when a releasing lever is moved, to assist in turning one of the axles as the car is started. The device operates effectively in either direction of travel.

CAR COUPLING.—Gustav Runge, Sidney, Neb. This invention provides an improvement in that class of side latching or Janney couplings in which each of the twin jaws is locked in engagement by a pivot bolt passing through it, the object being to provide a more secure lock than in other couplings of this class. This coupling can be readily arranged for coupling with the ordinary link and pin coupling.

BLOCK SIGNAL SYSTEM.—John La Burt, New York City. This system comprises a series of semaphores arranged along the track, a circuit closer connected with each and acting as a balance for it, an electric motor at each geared to depress the arm and raise the circuit closer, a lever mechanism for tripping the circuit closer by the passing of a train, and electrical connections whereby the tripping of the circuit closer of one semaphore will close the circuit through a motor at the next semaphore. The system is comparatively simple and not likely to get out of repair, is positive and efficient, and is automatically operated by the movement of the train to throw up a semaphore as the train passes a block, and throw down the arms in advance of and in the rear of a train. The invention also provides for automatically shutting off steam and stopping the train, should the engineer accidentally run over a block.

TO SECURE RAILROADS AGAINST LOSS OF FREIGHT.—Joseph B. Mockridge, New York City. The invention provides an original system for controlling the shipping of merchandise to secure railroads and shippers of merchandise against loss of freight. The system prevents, first, the loading of merchandise in the wrong car at the shipping station; and secondly, in case it should happen that a package is wrongly loaded in a car, then it is at once detected, and the railroad will have no difficulty whatever in tracing merchandise from the time it passed into its hands until it is delivered to the receiver. The means consist principally in printing a shipping receipt with characters indicating the receiving car, and a ticket containing like characters, so that ticket and receipt control each other. The ticket is delivered to the stevedore and placed into a receptacle held temporarily on or near the car destined for a certain distant point.

Electrical.

ROCKING CHAIR ATTACHMENT.—Charles E. Hartelius, Bay Ridge, N. Y. This is a dynamo attachment, so arranged that the movement of the chair will operate the dynamo and generate a mild current of electricity, which passes through electrodes on prominent places, as the arms, the current passing through the body when the occupant places his hands on the electrodes. This improvement does away with the use of batteries, and enables a person to take a gentle shock for any desired length of time, the chair being used in the ordinary way when the hands are removed from the electrodes.

Mechanical.

LUBRICATOR.—Vilhelm C. Th. Lohmann and Carl V. Andersen, Copenhagen, Denmark. This is a device adapted to automatically deliver a required quantity of oil to moving parts of machinery. It is very practical, durable, and inexpensive, and may be operated by the machinery it lubricates, while it can be easily and nicely adjusted to deliver just the required quantity of oil.

MOULD FORMING KNIFE.—Louis His, New York City. A vertically adjustable knife having an inclined lower edge is held by adjusting screws in the opposite end uprights of a supporting frame, a gauge, over which moves a pointer, being secured to one of the uprights. By means of this improvement a mould for a propeller blade may be quickly and accurately formed in a flask without the use of a pattern, the knife being quickly and nicely adjustable to form a mould of any necessary thickness.

CONTINUOUS BRICK KILN.—James P. Veirs, Omaha, Neb. In this kiln the brick burning proceeds continuously through a tunnel which returns into itself, the drying and burning of bricks, the cooling and removal of the burned bricks, and the recharging of the tunnel with green bricks, going on at the same time in different parts of the tunnel. The invention covers a peculiar construction and arrangement of parts whereby the operations are carried out more expeditiously, economically, and uniformly, insuring a better burning of the bricks and a greater economy of heat and saving of fuel.

Agricultural.

CORN HARVESTER.—Rasmus Pederson, Dramman, Minn. This machine is drawn between rows of corn and cuts the stalks of two rows at the same time, delivering the corn to tilting tables, and when bundles have been formed or suitable quantities accumulated, the tables are tilted to spill the corn upon the ground. The construction is such that the cutters or knives may be either stationary or laterally reciprocated as desired. The levers are all within convenient reach of the driver's seat, and the front of the machine may be lowered to cut the corn as close to or as far from the ground as may be desired.

Miscellaneous.

ADDING MACHINE.—Augustus J. Brooks, Wichita Falls, Texas. This machine, while being simple, inexpensive, and easily operated, is adapted to mechanically register the amounts of successive additions in such a way that there is no chance for mistake. In operation, every complete revolution of the units wheel moves the tens wheel, and every revolution of the latter moves the hundreds wheel, the successive additions being made by depressing the keys marked with the successive figures, and where columns of figures are added and the amount of successive additions is registered, a locking plate comes into use. The sum of an addition is displayed on number wheels to be read at sight slots of the machine.

CHECK REGISTER.—Carol T. Daniels, Naperville, Ill. This is a simple, convenient, and positively working apparatus which may be easily arranged for use, and is designed to keep an absolutely accurate account of sales made. Tablets of celluloid or similar material, each representing a definite amount, are held in troughs of novel construction in such a way that, when a sale is made, and the salesman presses downward on a key-piece, the front tablet is pushed through a slot into a drawer, the tablets being thus deposited in the drawer to represent the amount of each sale made.

PHOTOGRAPHIC PRINTING DEVICE.—Wilhelm Ohse, Dessau, Germany. The frame of this device has a back of translucent glass, the top and bottom being of a clear glass backed with a colored strip, while a holder adapted to receive a negative is located at the front of the frame opposite the translucent glass, and a lighting device is located back of the translucent glass. The device is designed to facilitate printing at night by lamp light, and is designed to afford as good effects in such printing, with certain negatives, as can be obtained with the best natural light—negatives of a certain density being thus better printed than can be done by sunlight.

MUSICAL INSTRUMENT.—August Pettersson, Eskilstuna, Sweden. This invention relates to stringed instruments, such as violins, etc., providing an improved instrument with additional strings, arranged in connection with the regular strings, to produce additional harmonious sounds that are difficult to produce on ordinary violins. The invention consists of a detachable casing held on the neck of the violin and provided with spindles connected with the additional strings, the latter being arranged close to the ordinary strings, so as to be sounded simultaneously with the latter to produce harmonious sounds.

WINDOW.—Peter Vandernoth, New York City. This window comprises a frame having a movable sill, parallel guide rods arranged on opposite sides of the frame, and overlapping window sashes held to slide and swing on the guide rods, the lower sash resting normally on the sill. With this improvement the window sashes may be swung wide open and raised to the upper portion of the frame, thus opening the entire window to permit the free circulation of air and to facilitate the passing in and out of various articles. The movements of the sashes are positive and easy, and they may be cased up tightly if desired to have the appearance of an ordinary window.

SHUTTER WORKER.—Louis Kutscher, New Britain, Conn. This is a device which may be readily attached to any window, and readily operated in connection with any blind carried by the window frame. It can be operated from the inside of a room to open or close the shutters, and to hold them locked in an open or closed position, or in any intermediate position, the device being very simple, durable, and inexpensive in construction.

SCRUBBER.—Ophelia Smith, Shepherdsville, Ky. This is a reversible device, having a scrubbing brush on one side and a mop on the other, for first loosening the dirt on a floor with the brush and then following with the mop, there being a further attachment of a wringer by means of which the mop may be easily wrung without touching it with the hands, the operator not being required to bend much.

BREAD RAISER.—John C. Nicholls, Blue Mound, Ill. This apparatus includes an outer casing having an inner raising chamber, below which is a hot air chamber, there being three means of regulating the heat in the raising chamber—one by adjusting the flame of the lamp, another by means of the valved air inlet openings, and the third by a valve-controlled outlet opening. The heat may be thus evenly distributed to the different portions of the raising chamber, the air of which will not be contaminated by any of the smoke or gases of the flame.

FAN.—Herman Scheuer, New York City. This is a simple form of fan adapted to be readily opened and closed, or snugly folded. It comprises a circular folding web, a metallic handle made in sections, a wooden strip secured on each metallic handle section and connected with the end of the web, and a metallic block held in the handle section and clamping the wooden strip in place at its outer end.

PNEUMATIC TIRE.—Foster H. Irons, Toledo, Ohio. This tire is formed with an exterior and an inner tube, each tube having a joint in its inner side, and a re-enforcing strip is held within the inner tube and arranged to cover the joint. The rubber tubes of the tire are moulded in a spiral shape, and straightened out when formed into a tire, thus contracting and condensing the rubber, so that if either tube is punctured the aperture will be closed by the pressure of the adjacent parts of the rubber.

FUNNEL.—Edward N. Gaudron, Portland, Oregon. Two patents have been granted this inventor for a funnel for conveniently filling liquids into receptacles, the funnel automatically closing when the vessel is filled to the proper height, at the same time retaining the liquid remaining in the funnel when the latter is removed from the filled vessel. A pivoted cylinder closed at its ends and containing a ball is connected at one side of its fulcrum with a valve adapted to close the funnel nozzle, a float being connected with the cylinder at that side of the fulcrum of the cylinder normally containing the ball, to trip the cylinder on the rising of the fluid. One of the patents especially provides for a magnet for finally seating the funnel valve.

ALE TAP.—John Neumann, Brooklyn, N. Y. Two patents have been issued to this inventor for ale taps, one patent providing specially for a tap adapted to withstand blows of a mallet when the tap is driven into a plugged cask, the tap being convenient to remove from an empty cask, having its faucet body separable from the tap shank, and being easy to manufacture. The shell of the tap, which may advantageously be made of cheaper metal than brass, has a faucet-protecting skeleton frame in front, an insertible faucet, and means for connecting the skeleton frame and faucet. The other patent provides a tap or spigot especially adapted for tapping casks in vaults or cellars, to be connected with a dispensing device in a room above. The tap is cheap and simple, while it is more durable than those of ordinary construction. The major portion of the tap may be made of malleable iron or soft steel, instead of brass, thereby greatly reducing the cost of production, and great facility is afforded for extending the tubular connection in any direction from either side of the tap stock.

LOADING DEVICE.—Louis A. De Mayo, New York City. This invention relates to devices for loading coal, grain, etc., into ships, from barges and other vessels, providing new and improved means therefor, to facilitate performing the work rapidly, without requiring much labor. Boxes, each having doors in its sides, are mounted to slide vertically in the barge, each of the boxes being preferably of nearly the width of the barge, and means are provided for raising the boxes separately or collectively.

SUSPENDERS.—Michael Feldman, New York City. This invention provides suspenders designed to insure the comfort of the wearer, the rear suspender ends readily adjusting themselves on the shoulder straps according to the movement of the wearer's body. The connection for the rear ends of the shoulder straps is provided with an elastic band, and its middle portion forms a self-adjusting bearing for the rear suspender ends.

LADDER.—Charles V. Childs, Pittsburg, Pa. This ladder is made in two sections hinged together, and a truss connecting the two sections with each other in such a manner as to prevent the sections from spreading when the ladder is used as a step ladder, and to strengthen the sections when they are extended to form a straight ladder. The ladder may be quickly and conveniently changed from a step ladder to a straight ladder and vice versa, and it can be very cheaply manufactured.

ROTATING GRAIN WEIGHER.—Benjamin Simons, Charleston, S. C. Fulcrumed upon a main frame is a balance frame carrying a rotary bucket wheel at one end and a track way at its opposite end, upon which travels a movable weight, stops on the main frame limiting the opposite movements of the weight. Automatic locking devices are adapted to lock the bucket wheel from rotating when raised, becoming disconnected therefrom when the wheel is depressed. Upon the upper board of the frame is a registering mechanism which records every dump of the bucket wheel.

STRAP.—Nils. Nilsson, Brooklyn, N. Y. This is a metallic strap adapted to be used on packing cases and boxes of all kinds, the bands or straps being also capable of use as corner irons simply. The strap has openings to receive nails and fastening devices, the metal around each opening being so shaped that when the nails are driven the openings will be entirely closed, and the metal at the edges will be driven down into the material from which the box or casing is made.

HOOF TRIMMER.—Henry C. McCleave, Trimble, Ill. This tool comprises a knife part having an attached handle and an adjustable fulcrum part or bar having an upturned hook or lip at its outer end, the fulcrum piece having a series of holes by which it may be adjustably attached by a pivot to the knife. The implement is designed to greatly facilitate trimming the hoofs of horses or other animals preparatory to shoeing them, the work being thus effected more quickly and with less muscular exertion.

MATCH BOX.—Howard Cramer, Newberry, Penn. This invention provides a box in which the matches are retained by their heads, slightly separated from each other, the matches being individually ignited as they are withdrawn, without setting fire to any of the others. The box may be readily filled when empty, and the improvement is designed to prevent smokers or others using matches from carrying off a handful of matches when it is intended to supply gratis but one.

SHAMPOOING HAIR AND SCALP.—William C. Voss, Geneseo, Ill. A steam shampooing device is provided by this invention, the device being also arranged to dry the hair and scalp after they have been subjected to the action of steam. It is designed that a cleansing compound shall be sprayed upon the hair and scalp during steaming, the arrangement being such as to prevent the hair and scalp from being too highly heated. A bellows or air attachment may be used or not as desired, and either hot or cold air used in drying the hair and scalp.

SYRINGE.—Joshua M. Wardell, Cadillac, Mich. This invention provides novel features in the nozzle and body of the syringe, whereby water of the required temperature may be discharged in a circle of jets or streams from the nozzle.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

STAR MAPS FOR EVERY MONTH IN THE YEAR. Specially prepared for use in North America. By Richard A. Proctor.—LUMINOUS STARS. A method for quickly learning the names and positions of the constellations, the movements of the planets, etc. By Alfred E. Beach. New York: Munn & Co. 1893. Pp. 35. Price $2.50.

In this very elegant work we have given Proctor's celebrated star maps, twelve in number, for the night sky visible during different parts of the year. These maps are very elegantly printed in blue ground with the stars' constellation outlines, Greek letters and names in white. To make each map precise, the hours it corresponds to on each of six dates are given with each map. On the page opposite each map is given a full description.

The second portion of the work, "Luminous Stars," will have a more special interest, derived from its novelty as a delightful method of studying astronomy. The use of phosphorescent stars upon a dark background, or of dark stars upon a phosphorescent background, has already been described by Mr. Beach to the readers of the SCIENTIFIC AMERICAN. In this work we have the same subject put into permanent shape for the library and home. It is a home book—one which will do much to popularize the fascinating study of astronomy.

THE LIVING METHOD FOR LEARNING HOW TO THINK IN FRENCH. By Charles F. Kroeh, A.M. London, and Hoboken, N. J. Published by the author. Pp. 140, vii, ii. Price $1.

Prof. Kroeh, in stating the basis of his method of learning French, states that you cannot speak French while thinking in English. To learn French he observes it is not necessary to live in France, but you must live in French. He therefore directs the student to associate complete French sentences with his daily actions. This book therefore carrying out this idea gives French sentences which describe the general actions of any one's daily existence, and presents an ingenious, easy, and practical system of rapidly acquiring familiarity with this beautiful language. It is decidedly the best work for the learner that has come under our notice. The "living method" is an outgrowth of the "natural method." As a species of appendix to this work, the author is preparing to supply at $5 a set phonograph cylinders which will give the pronunciation of the fundamental French sentences, the object being not to supersede the teacher, but to lighten his labor by enabling the learner to practice at home.

POOR'S HANDBOOK OF INVESTMENT SECURITIES. A supplement to Poor's Manual of Railroads 1892-93. Pp. 986.

We have to acknowledge the receipt of this standard work. Any review of it seems quite unnecessary, in the light of the authoritative stand which has been taken by Poor's Manual of Railroads among financiers. What that book does for railroads, this does for various investment securities. Every kind of information required by the general investor as regards the character of the investments, interest paid, when payable, and range of values of securities, and other allied topics, will be found to be exhaustively treated here. It is the third annual issue, and it is safe to say that many of those possessing the one work will have equal necessity for the other.

LOGARITHMIC TABLES. By Professor George William Jones, of Cornell University. Fourth edition. London: Macmillan & Co. Ithaca, N. Y.: George W. Jones. 1893. Pp. 160. Price $1.

These tables will be welcomed by computers from their particularly clear arrangement. The numbers are widely spaced, and every facility is given for the application of differences in finding logarithms to the final figure. The range covered may be deduced from the fact that there are 18 different tables. Besides the tables of logarithms and logarithmic functions, some very valuable collection of data, etc., are given under mathematical constants used in chemistry, engineering and physics. The author offers a reward of $1 for the first notice of each error, an excellent guarantee for the subsequent editions which we are sure will follow the present.

THE MINING DIRECTORY AND REFERENCE BOOK OF THE UNITED STATES CANADA AND MEXICO. George W. Ramage, editor. Chicago, Ill.: Pool Bros., publishers. 1892. Pp. 551. Price $10.

To those interested in mining engineering, and the subjects connected therewith, the above work would seem to be of very great interest and in many cases indispensable. The book contains a most exhaustive list of all kinds of mines and quarries throughout the United States and Provinces. It also gives compilations of the

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different mining laws of the States. Even from the point of view of its advertisements only, the work will have definite value for mining engineers and capitalists.

HOW TO KNOW THE WILD FLOWERS: A GUIDE TO THE NAMES, HAUNTS, AND HABITS OF OUR COMMON WILD FLOWERS. By Mrs. William Starr Dana. Illustrated by Marion Satterlee. New York: Charles Scribner's Sons. 1893. Pp. xv, 298. Price $1.50.

This is not a botany, but is designed to have a place in the family where the botany with its technical description and its tedious Latin names would lie neglected in the corner. There is no ignorance so profound and startling as the ignorance shown by even intelligent and educated people about the commonest plants and flowers about them. This work is intended as a guide and aid to such, and not only would the reader learn to have, as the authoress says, a "bowing acquaintance" with old neighbors, but would with little effort be able to call them by name. The work possesses literary merit, and when the description seems to the authoress to wax a little dry, it is redeemed by some happy quotation or by some song of summertide. The accuracy and precision of the description is not sacrificed, however, and the scientific treatment is preserved throughout. There are separate indices for the Latin, the technical, and the common English names of the various flowers. The plants may be readily identified by the illustrations which are very carefully executed and are quite numerous, there being 104 plates, most of which were sketched directly from nature. The book is handy in form and may be easily carried in a stroll through the woods.

MANUAL OF IRRIGATION ENGINEERING. By Herbert M. Wilson, C.E. First edition. New York: John Wiley & Sons. 1893. Pp. xx, 351. Price $4.

Irrigation is every year acquiring increased importance in the Western States. It will yet modify enormous areas of our Western Territories, and may even bring about climatic changes. This work is therefore particularly timely and represents what has been a long felt want. It is written thoroughly up to date and does not confine itself to the smaller features of irrigation, but treats of the great dams of the world as well as of the irrigating conduit. Numerous illustrations of structures and many diagrams are interspersed throughout the text, so that the whole subject is thoroughly covered and illustrated. The measurement of water is treated very interestingly, including the current water meters, the miner's inch, etc. We cordially recommend the book to our readers.

☞Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION.

APRIL, 1893, NUMBER.—(No. 90.)

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1. Elegant plate in colors, showing an attractive cottage at Villa Park, Mt. Vernon, N. Y. Floor plans and perspective elevations. Cost $4,500 complete. Mr. Walter Stickels, architect, Mt. Vernon, N. Y.
2. Plate in colors showing the handsome Queen Anne residence of the Hon. Craig A. March, at Plainfield, N. J. Two perspective views and floor plans. Mr. Chas. H. Smith, architect, New York. An excellent design.
3. A dwelling near Longwood, Mass., erected at a cost of $5,200 complete. Perspective views and floor plans. A model design.
4. A dwelling at Chester Hill, Mt. Vernon, N. Y., erected at a cost of $4,750 complete. Floor plans, perspective view, etc. Mr. W. H. Symonds, architect, New York.
5. Engraving and floor plans of a residence at Oakwood, Staten Island, N. Y., erected at a cost of $3,540 complete. Mr. W. H. Mersereau, architect, New York.
6. A stable erected at Bridgeport, Conn. A unique design.
7. A residence at Wayne, Pa. A very picturesque design, treated in the Queen Anne and Colonial styles. perspective elevation and floor plans. Cost, $6,250 complete. Messrs. F. L. & W. L. Price, architects, Philadelphia.
8. Engraving and floor plans of a Queen Anne residence at Newton Highlands, Mass. Cost, $6,000. Messrs. Rand & Taylor, architects, Boston.
9. A square-rigged house, recently erected at Allston, Mass. Cost, $2,600. Plans and perspective elevation. Mr. A. W. Pease, architect, Boston, Mass.
10. The Fifth Avenue Theater, New York. View of the main front, showing the terra cotta decorations; also view showing the iron framework, erected by the Riverside Bridge and Iron Co., and a view showing the fireproof arching, erected by the Guastavino Fireproof Construction Co.
11. Sketch of a dining-room fireplace.
12. Miscellaneous contents: An improved woodworking machine, illustrated.—A new edge moulding or shaping machine, illustrated.—The box industry.—Natural gas at Geneva, N. Y.—Plaster of Paris floors.—Inside sliding window blinds and screens, illustrated.—City pavements—The Alberene laundry tub, illustrated.—The "Murray" phaeton, illustrated.—An elegant bath tub, illustrated.—To thaw out frozen pipes.—Improved plane irons, illustrated.

The Scientific American Architects and Builders lition is issued monthly. $2.50 a year. Single copies, cents. Forty large quarto pages, equal to about o hundred ordinary book pages; forming, practilly, a large and splendid MAGAZINE OF ARCHITECRE, richly adorned with elegant plates in colors and th fine engravings, illustrating the most interesting amples of Modern Architectural Construction and lied subjects.

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Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

Acme engine, 1 to 5 H. P. See adv. next issue.

Portable and Stationary Cylinder Boring machines. Pedrick & Ayer, Philadelphia, Pa.

Best Handle Machinery. Trevor Mfg. Co., Lockport, N. Y.

Have you tried "aluminum Babbitt metal"? Write A. W. Cadman Mfg. Co., Pittsburgh, Pa., about it.

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William Jessop & Sons, Ltd., the celebrated steel makers, observe the centennial of their firm this year.

Stow flexible shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See adv., page 174.

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Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

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Fine Castings in Brass, Bronze, Composition (Gun Metal), German Silver. Unequaled facilities Jas. J. McKenna & Bro., 424 and 426 East 23d St., New York.

For Sale—New 5 horse power upright engine, 5" x 5" cylinder and 30 x 5 ft. boiler, upright, new. All guaranteed. Spot cash, only $181. Wm. C. Codd, Baltimore, Md.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Canning machinery outfits complete, oil burners for soldering, air pumps, can wipers, can testers, labeling machines. Presses and dies. Burt Mfg. Co., Rochester, N. Y.

An investor desires to communicate with inventors needing funds to patent, develop, or promote their inventions. References. "Financial," Scientific American, New York.

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

For Sale—Patent No. 494,106, lubricator. Inventors, Vilh. Lohmann and Carl Andersen, Copenhagen. Described in Scientific American, April 8, page 219. Address V. L., P. O. box 2212, New York.

Inventors and Business Men Take Notice—We incorporate stock companies for any business. Send 10 cents for report blanks. Don't wait. Write now. It may be worth money to you. Backus & Co., Cleveland, Ohio.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(4828) J. P. asks: What solution should be used in a Smee's cell in order to get the most strength from the cell? A. The solution used in the Smee battery is sulphuric acid 1 part, water 9 parts. The zincs must be well amalgamated and the platinized silver or carbon should be in good condition to insure perfect depolarization.

(4829) H. B. asks: Can you let me know anything concerning metal plating with Russian white metal for knives and forks? That is, the metal is melted. A. The Russian white metal is probably only a name given to Banca tin, with possibly a small admixture of bismuth to make it flow easy. It is being extensively advertised in the West. The work done with it is excellent. The directions are sold.

(4830) P. F. M. says: As your paper is one of our "standard text books" in our High School, will you please answer in your "Notes and Queries:" 1. If water at 39° Fah. were perfectly confined, could it be frozen in any temperature; *i. e.* could it not expand? A. Water when confined at the temperature of greatest density, 39°, upon being cooled below the freezing point, produces an immense pressure, and begins to freeze at a few degrees below 32°. The increasing pressure from the expansion of the ice so retards the freezing of the remaining water that a temperature below zero may be reached before it is all frozen. 2. Will you please give rule for finding horse power of ordinary locomotive, with cylinders 17 × 24 and 5 foot drivers, steam pressure in boiler 130, and speed 15 miles per hour? 30 miles? A. The actual horse power of a locomotive is so variable that any computation depends entirely upon the cut-off, and the cut-off is governed by the actual pull required of the engine. Assuming a heavy train at 15 miles per hour and a mean piston pressure of 50 pounds per square inch, the piston speed will be approximately $\frac{15 \text{ m.} \times 5{,}280 \text{ feet}}{60} = 1{,}320$ feet wheel speed per minute and $\frac{1{,}320}{15' \text{ (circumference of wheel)}} = 88$ revolutions per minute. As a revolution is equal to twice the stroke, then 88 × 4 feet = 352 feet piston speed per minute. The area of the cylinders is 2 × 226 square inches = 452 square inches × 50 pounds mean pressure × 352 feet piston speed per minute = $\frac{7{,}955{,}200}{33{,}000} = 241$ horse power. The possibilities of such an engine are about 400 horse power. The increase in power of the engine is not proportional to the increase in speed, and for 30 miles may be no more than 300 horse power. 3. Why are the wheels of a locomotive larger near the flange? And how can it pass a curve when the wheels are worn half an inch smaller next to the flange? A. The taper tread on driving wheels is to partially compensate by difference in circumference made by the wheel flanges hugging the outer rail on curves, the wheels slipping to make up for the loss of compensation by taper. Wheels that are grooved run hard on curves, as well also on straight tracks.

(4831) G. J. L. writes: To settle a dispute will you kindly state what scientific astronomers suppose or figure the temperature of the boundless space of the firmament outside of the influence of suns and worlds? If it were possible to have such a thermometer, what would it register if placed in the opposite direction from the sun, as far away from the earth as the sun, where the sun's rays would not be affected by friction of atmosphere whatever? A. The temperature of interplanetary and stellar space is supposed not to be lower than absolute zero, or 461° Fah. below zero Fah., or 493° below freezing temperature.

(4832) L. A. L. writes: Last fall I dug a well here for domestic use. I struck water at 26 feet, in a gravel bed, immediately below a stratum of blue clay. We have used the water all winter and always considered it good (though hard) until a week or so ago, when it developed a peculiar minera taste, having a lot of reddish sediment in it. I inclose a sample of this latter, which I took from less than a gallon of the water. I would like to know what is the reason of it, and also if it is safe to use the water? A. The sample appears to be oxide of iron and clay. Probably it is harmless, but not pleasant to drink. We recommend putting a drive pipe in the bottom of the well and connecting directly with a pump to draw water from a deeper and possibly more satisfactory stratum.

(4833) L. S. F. asks the fastest way to find how many gallons a cistern or tank can hold, and if it is better to pump water into a tank through the bottom. I can use the pipes to lead the water off or where we need it; but I think it is much harder on the pumps when the tank is half full. A. If tank is round, square the diameter in feet and decimals. Multiply the product by 0·7854. Multiply last product by the height in feet, for cubic feet. Multiply the cubic feet by 7½ for gallons. You can pump into bottom of the tank or the distributing pipe without loss of power.

(4834) L. W. B. asks if copper is more difficult to heat by hammering than soft iron. A. Copper develops less heat than wrought iron by hammering or compression. Its specific heat is considerably less than that of wrought iron. It also parts with its heat faster than iron.

(4835) B. asks: Would the atmospheric pressure on a piece of gold leaf be greater than on a spherical piece of gold which displaces the same amount of air? A. The pressure is as the surface exposed to atmospheric pressure. The total pressure would be much greater on the gold leaf.

(4836) G. S. N. asks how the induction coil in a Blake transmitter for a telephone is wound, amount of wire, etc. A. The induction coil in the Blake transmitter consists of a bundle of soft iron wires, No. 20, inserted in a thin spool, about 2½ inches long, with two layers of No. 20 wire on the spool and ten layers of No. 36 wire wound in the primary wire, an intervening layer of writing paper being tightly wrapped on the primary before winding the secondary. The direction of the winding in either case is immaterial.

(4837) G. D. C. asks: 1. Will the gravity or Crowfoot battery run the simple electric motor in Experimental Science? If so, how many cells will it take to get enough power to run a sewing machine or other light machinery? A. The gravity battery, owing to its resistance, is not suitable for running an electric motor. 2. What size wire should I use to make one half the size of the one described? I have completed the one man power, now I want a smaller one. A. If you intend to make a smaller motor, one-half the size linear, No. 20 wire will be about right.

(4838) J. N. F. asks: How many strokes per minute can an air compressor, similar to the one used by the Westinghouse Air Brake Company, be driven and work successfully? Or, in other words, how many cubic inches of air will valves of similar size and capacity receive and deliver per minute? A. The Westinghouse air brake can safely make 250 single strokes per minute, and will deliver air at nearly their full capacity, the valves being equal to their pumping capacity. We cannot name the cubic inches.

(4839) F. & T. ask how many storage batteries it would take to run eight lights (incandescent) for five or eight hours, provided the cells were about 12 × 7 × 5? A. The number of storage batteries required to run your lights depends upon the resistance of the lamps. For eight 20 volt lamps you will need 11 cells; for eight 30 volt lamps you will require 16 cells; for eight 50 volt lamps you will require 26 cells; but these cells will run about 20 such lamps.

(4840) J. W. D. writes: I am winding some field magnets with two wires in parallel, and I wish to determine their resistance when so connected. The two wires are of different sizes. One is No. 22 double cotton-covered and the other is No. 21 bare. I do not know how much of each yet, so I would be greatly obliged if you could give me some general rule for finding the resistance. I should also like to know the comparative resistance of the fields and armature in shunt and series wound dynamos. A. It is bad practice to wind the field magnet with wire of two sizes. No. 22 wire runs 60 feet 6 inches to the ohm, while No. 21 is 76 feet 4 inches to the ohm. In a shunt wound machine the resistance of the field magnet should be about fourteen times that of the armature, while in a series wound machine the resistance should be as small as possible consistent with the proper excitement of the field magnet.

(4841) B. J. E. says: If oil put in the cylinder of an engine would pass through the exhaust pipe (into a well into which the suction pipe runs) and be drawn into the boiler with the water, would the oil ignite or cause boiler explosion if taken up? Or would it take a long time before enough oil to get into the boiler, as the boiler pipe, of course, is at the bottom of the well? A. The oil from the exhaust pipe in the well might do no harm for a while; but its gradual accumulation would cause it to come within the range of the suction pipe and to the boiler. In the boiler it will tend to gather the dirt and loose scale, forming masses that agglomerate and finally lodge on the fire sheet, cause it to be overheated, bulge, and if not discovered in time may cause a disaster. Many a boiler has made a large bill of expense from this cause alone. The oil will not ignite in the boiler; the danger is from lodging over the fire and allowing the boiler plate to be heated red hot and to bulge.

(4842) P. B. asks: 1. How many volts does it take to run the small electric motor described and illustrated in No. 641 of the SCIENTIFIC AMERICAN SUPPLEMENT? A. Two volts. 2. Of what resistance is the field magnet and of what resistance is the armature? A. The resistance has not been measured. We think, however, that the entire resistance of the machine is not more than three or four ohms.

(4843) E. E. J. says: I am desirous to know which is the hardest to bend, a solid bar, say 2 inches in diameter and 6 feet long, or a hollow bar of the same dimensions having a 1 inch hole in the center. What is their difference, both in strength and price of manufacture? A. The solid bar is the hardest to bend, *i. e.*, it will bear the greatest load, and costs less than a hollow bar, which by your dimensions would have to be a double extra strong pipe, which costs twice as much as a solid bar of the same size. On the other hand, the same weight of metal as a tube is harder to bend, or will bear more weight than a solid bar, both of the same length.

(4844) C. H. S. says: Will you please give me a rule, through Notes and Queries, for finding the remaining bearings of a survey when the interior angles, length of sides, and the bearing of one side are given? A. Plot the survey on paper with the side having the given bearing for the base, and draw the meridian at the proper angle with the side given. Use the difference of the given course and the meridian for adjusting the several angles of the plot. Make the necessary changes as the angles carry the lines across the cardinal points of the compass. Then retrace the angles and bearing the reverse way to prove the work. See Gillespie's Surveying, by Staley, a complete guide to the survey and plotting of land. $3.50, maile .

(4845) W. H. P. writes: I have a storage battery which, after charging for about twenty hours with large dynamo, it will only run about two hours. It looks to me as though it runs down while not in use, as it gives a large spark when freshly charged. The negative plates look all right, but the positive plates look empty. If so, how can I refill them? Is there any article on making and repairing storage batteries in the SCIENTIFIC AMERICAN? If so, what number? A. Possibly your storage battery is short-circuited, or it may be that you are using it on machines having too little resistance. We think you have destroyed your storage battery by subjecting it to the action of too much current. Better send the battery to the makers for refilling. We hardly think you will be able to refill the plates yourself. You will find many references to articles on storage batteries in our new SUPPLEMENT catalogue, which is mailed to any address without charge.

(4846) A. L. E. writes: In your issue of March 4, 1893, page 134, C. L. Wolley describes a storage cell. What is the use of the red lead paste? How are the connections made with dynamo or primary cells when charging it? How long should the connection between dynamo and storage cell be kept up? When charged, how long will it be before it is necessary to charge it again? Can you give a description of a small dynamo, one say that would run from 10 to 20 incandescent lamps? A. Red lead paste is used on storage battery plates to facilitate the forming of the oxide, the red lead being more easily converted into lead peroxide than the metallic lead. The two poles of the battery are connected with the binding posts of the dynamo for charging, and the battery should always be connected up in the same manner. It requires from five to seven hours to charge a storage battery. We cannot, within these limits, give you full information in regard to the construction and use of storage batteries and dynamos. We refer you to our SUPPLEMENT catalogue.

(4847) C. P. P.—1. Please give me a list of all the metals, as I am unable to find a complete list, including the later discoveries. A. A list of metals will soon be published in the SCIENTIFIC AMERICAN. 2. What is the fastest railroad time ever made? When and where was it made? A. The fastest railroad time is claimed at the rate of 80 to 90 miles per hour on the Central Railroad of New Jersey, between Bound Brook and New York. See SCIENTIFIC AMERICAN, October 24 and November 21, 1891, for particulars of fast railway time.

(4848) H. G. M. writes: I am designing an automatic plug for electric light circuits. The plan requires a substance of great resistance, which will expand greatly when hot. Now what I want to know is, what will this substance have to be to heat and expand quite a little with about 4 amperes and 110 volts? A. We know of no substance better adapted for your purpose than brass. Compound bars of brass and steel are often used for thermostatic bars. Possibly such a bar would be better than one of brass only. Neither the brass bar nor the compound bar would have great resistance.

(4849) L. P. writes: I have built my house from plans made by you, and am more than pleased with it. Since then a number of lightning rod agents have been around to try to sell me their rods.

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Would it not be just as safe to put up ½ inch or ¾ inch gas pipe, with a good point and a large plate at the bottom to scatter the current? A. Gas pipe is often used for lightning rods, but iron is not as good; copper is preferable. Probably the best form of lightning rod is a copper strip nailed directly to a building and connected with a good earth plate.

(4850) F. K. & Son ask: 1. What size belt should we use to deliver 1½ horse power; speed of main shaft 260 revolutions, with 12 inch pulley to drive line shaft, having an 18 inch pulley? A. A 1½ inch belt. 2. What size belt should we use to deliver 1½ horse power; speed of main shaft 173 revolutions, with 10 inch pulley, to drive line shaft with 16 inch pulley? A. A 2 inch belt. 3. What size belt should we use to deliver 1½ horse power; speed of main shaft 173 revolutions, with 16 inch pulley to drive line shaft with a 12 inch pulley? A. A 1½ inch belt.

(4851) G. R. C. writes: A friend of mine would like to know why a Stevenson horizontal check valve will clatter, and does not seat when he stops the feed pump; and as long as it clatters it leaks, and when it does not is perfectly tight, and to stop its clattering he has to close the globe valve between the check and the boiler, or open the pet cock on the air chamber. The clattering resembles a telegraph instrument with the circuit open and closed two or three hundred times a minute. A. The air in the pump chamber is highly compressed, according to the pressure in the boiler. It is elastic and acts like a spring on the water in the pipe between the pump and the boiler. The action of the water in the boiler when making steam is like a tremor or vibration, and communicates a vibratory motion to the water in the feed pipe, which is balanced by the air pressure in the air chamber. The opening of the pet cock breaks the exact balance and the overpressure from the boiler closes the check valve. The closing of the valve between the boiler and the check valve also stops the vibration by closing communication with the boiler.

(4852) H. H. S. asks: 1. What chemical is put in the porous cup of a Leclanche battery? A. Equal parts of granulated carbon and granulated black oxide of manganese. 2. What chemicals are used in electroplating with copper, and in what proportion are they mixed? A. For an answer to this query we refer you to SUPPLEMENT 310. 3. Is there any chemical that will take the copper coating off the sticks of carbon from an arc light without destroying the carbon? A. Use nitric acid. 4. Is there any article on the construction of an electric machine in the SUPPLEMENT? A. You will find a description of the Holtz machine in SUPPLEMENTS 278 and 279, and of the Wimshurst machine, in Nos. 546, 648, 584, and 647.

(4853) E. F. S.—1. Where I work we have a large quantity of glue which has been used for moulds in plaster casting (plaster of Paris). It has become very dirty and hard from grease and bits of plaster, etc., and unfit for use. Is there any way to renew it at reasonable cost? A. Glue and glycerine jelly, adding a little water to thin it, and strain it through a cloth, hot. Skim off any oil that may rise in heating. Boil the strained jelly to evaporate the water. 2. Would ether or chloroform work better in an ice machine, not taking cost into consideration? A. Ether is preferable as a refrigerant in ice machines. 3. Some time ago I saw a description of magazine photograph camera in your paper. Where can I find it? A. The magazine camera is described in SCIENTIFIC AMERICAN, July 16, 1892.

(4854) O. G. F. M. says: 1. Have a shunt-wound dynamo, with 4 wire No. 20 on field and 1½ same on armature. I carry from 5 to 7 16-candle power lamps of 50 volts each; but the field magnets get very hot. It does not matter what load I have or whether I insert some resistance in field magnets. What is the reason? Is the wire wound in the right proportion? A. Too much of your current goes around your field magnet. You should rewind with finer wire, say No. 24, or use the machine as a series machine. 2. Can you give me a formula of some good composition for use in blocking tablets, something which will not adhere to the sheet of paper when torn off? A. The composition is said to be prepared as follows: Glue, 4 pounds; glycerine, 2 pounds; linseed oil, ½ pound; sugar, ¼ pound; aniline dyes, q. s. to color. The glue is softened by soaking it in a little cold water, then dissolved together with the sugar in the glycerine, by aid of heat over a water bath. To this the dyes are added, after which the oil is well stirred in. It is used hot. Another composition of a somewhat similar nature is prepared as follows: Glue, 1 pound; glycerine, 4 ounces; glucose sirup, about 2 tablespoonfuls; tannin, one-tenth ounce. Give the compositions an hour or more in which to dry or set before cutting or handling the pads.

(4855) P. J. L. asks: 1. What objection can be urged against the sprocket wheel and chain for high speed belting? Does it make too much noise or is the friction greater than leather or rubber? A. The sprocket wheel and link belt is noisy under high speed and has considerable more friction than belts of leather or rubber. It is not a noiseless transmitter of power under any speed, and seems to have been invented for a peculiar work not suited for the nature of belts or for a slow and unyielding pull. 2. What, if anything, has been done or accomplished in the way of compounding the explosive force of gas compounds in gas engines, and would not there be a reaction of the expansion of this combustion, the same as the condensation of steam in a steam cylinder? A. There has been no practical application of a compounding system to the gasengine. Heretofore, the irregular and intermittent action of the explosive force seems to have been a bar to efforts at compounding, yet with the later improvements we do not see why there is not a good field open for compounding gas engines. Of course there can be no condensation and no latent heat to keep up the temperature, and therefore the principle of expansion in a second cylinder would have to conform to the limit of a compound air engine.

(4856) A. E. H. asks: Would a lamp of the following description be safe and practical? Gasoline to be used instead of coal oil, the bowl to be near the bottom, the burner to be not closer than 4 inches above, the intervening space to be used for the generating of the gas, the lamp to be made of strong material such as cast iron or something that will not break and that will stand considerable pressure. A. We cannot recommend any form of gasoline lamp for house use. There are many difficulties and dangers attending the use of gasoline unless entirely isolated from the lamp. There is a class of gasoline lamps or torches used for outdoor illumination with large, smoky flames, in which the fountain is several feet from the burner, with the feed regulated by a cock. The gasoline is vaporized in the burner. They can be procured through the lamp trade.

(4857) F. K. says: Please inform me which of the common metals expands and contracts most and how much per foot with a change of 20° tem. Also how much will an iron wire, No. 16 B. S., 10 feet long, expand with 20° rise in temperature and what force will it give? A. Zinc expands and contracts most of all the metals by changes of temperature. It expands a fraction over 0·004 of an inch per foot for 20° rise in temperature. Iron wire about 0·002 of an inch per foot for 20° rise in temperature, or 0·020 of an inch for a 10 foot rod, its push will be equal to the elastic strength or size of the wire or rod.

(4858) A. B. asks: 1. Can double thick window glass be used for the glass plates of an "influence" electric machine? A. Yes; but it is not as desirable as the thinner glass. 2. How can I drill a hole in the center of the glass plates? A. Make a drill from Stubs' wire, without heating or forging. Heat it to a low red and plunge it into a solution of chloride of zinc (ordinary soldering fluid). With this drill you can readily make holes through a glass plate. You should lubricate it with turpentine. 3. What numbers of the SCIENTIFIC AMERICAN SUPPLEMENT give the best directions and drawings for making an influence machine? A. You will find articles on the Wimshurst machine in SUPPLEMENT, Nos. 546, 648, 584 and 647.

TO INVENTORS.

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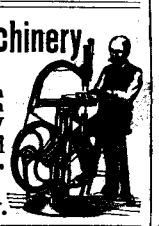

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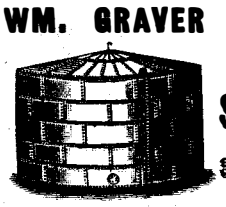

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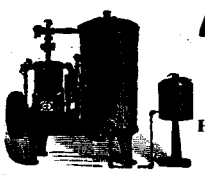

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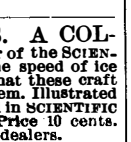

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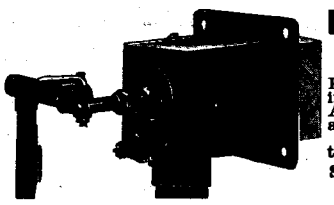

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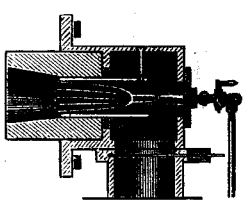

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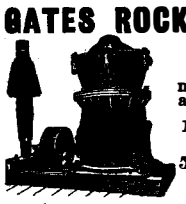

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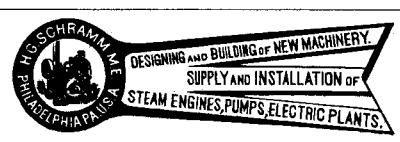
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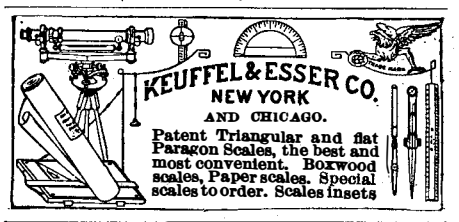

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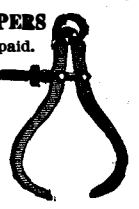

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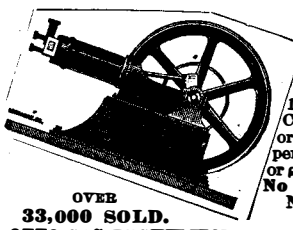

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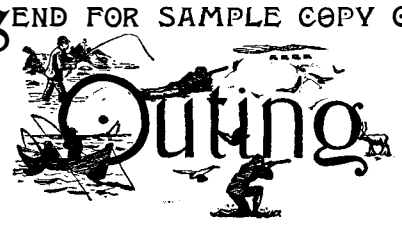

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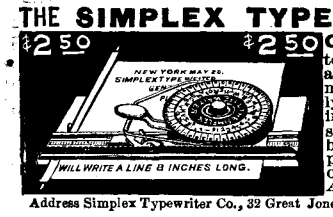

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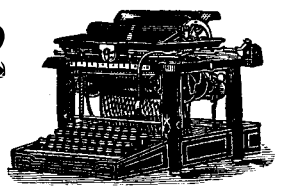

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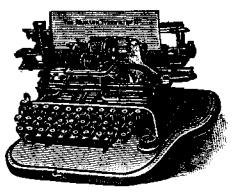

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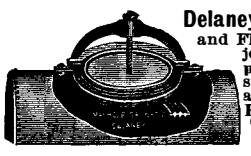

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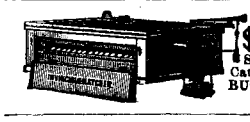

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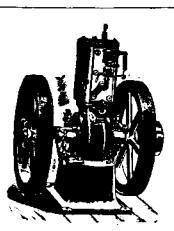

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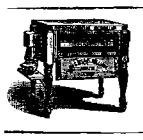

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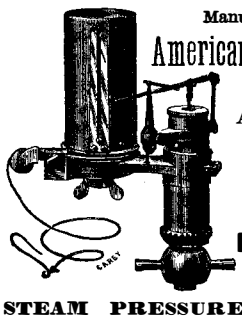

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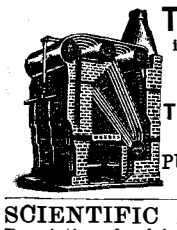

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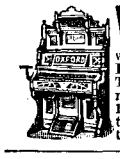

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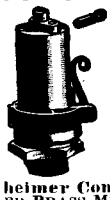

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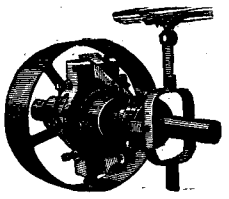

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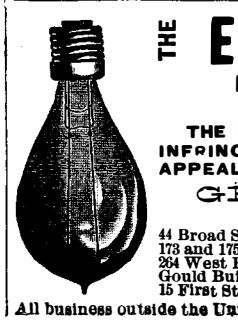

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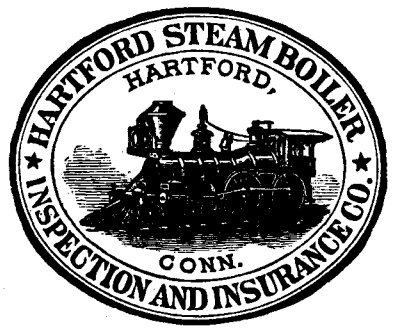

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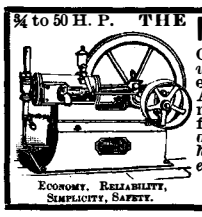

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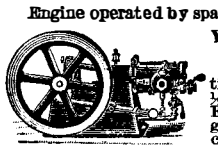

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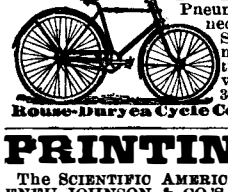

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